THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

Vol. LIX. No. 1501.] LONDON, FEBRUARY 16, 1892. [44th Year. Price 6d.

WOLSTON'S Paste and Ready Mixed for Use.
Guaranteed Free from Adulteration. **TORBAY PAINTS.**
FOR GASHOLDERS, &c., &c.
The Original "Torbay Paints" As supplied during the present and many preceding years to the LONDON GASLIGHT & COKE COMPANY.
Special Quotations to Gas Companies.
TORBAY & DART PAINT Co., Ld.,
DARTMOUTH, DEVON,
And 23, St. George St., Westminster, S.W.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
The Only Makers of
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.
Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES,
Manufacturing Gas Engineers.
See Advertisement, p. 282.

CEMENT
EARLE'S
BEST
Portland Cement
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.
Offices: 7, 8, & 9, PIER STREET.
Works: WILMINGTON.
STOREAGE CAPACITY 10,000 Tons.
ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
Telegraphic Address: "Cement Hull."

NORTON'S PATENT
"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.
The following Town Water-Works Supplies have been obtained by this System, viz.:—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.
LE GRAND & SUTCLIFF,
HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

SELF-CONTAINED DUST-FUEL FURNACE.
MELDRUM'S PATENT.

Extract from the *Smethwick Telephone*, June 13, 1891.

GAS COMMITTEE.

"The Manager [B. W. Smith, Esq.] reported that the adoption of MELDRUM'S PATENT FURNACES, he estimated, had resulted in a saving of 150 tons of Slack during the nine months they had been at work in the Boiler-House, and 360 tons of Slack during four months in the Retort-House; the fuel used in place of slack being the fine coke dust which formerly had to be carted or boated away at considerable expense."

MELDRUM BROS., Engineers,
ATLANTIC WORKS, 13, CITY ROAD, MANCHESTER.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765).

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

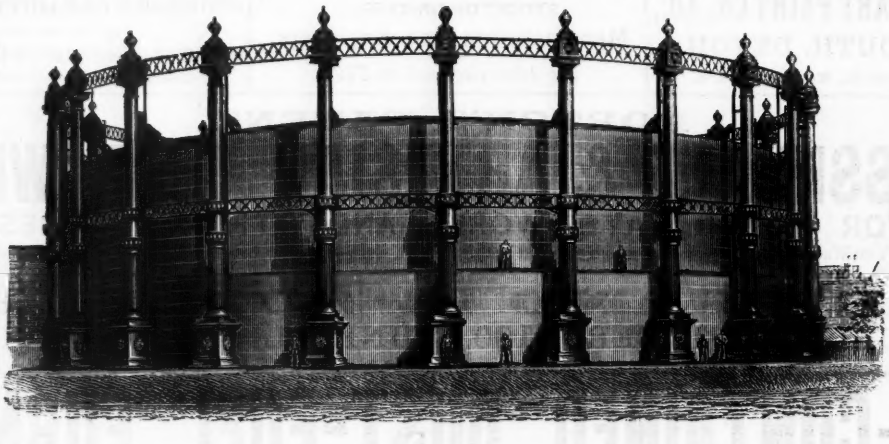
TELEGRAPHIC ADDRESS: "COCKEY'S FROME."

EDWARD COCKEY & SONS, Ld.,

ESTABLISHED OVER HALF A CENTURY.

GAS ENGINEERS, IRONFOUNDERS, & CONTRACTORS,

Manufacturers of GASHOLDERS and TANKS, BOILERS and ENGINES, ROOFS, EXHAUSTERS, BREEZE SCREENS, CHARGING and COKE BARROWS.



Manufacturers of PATENT WASHERS, PATENT VALVES for PURIFIERS, &c., GOVERNORS, LAMP COLUMNS, Weighbridges, COKE BREAKERS.

SOLE MAKERS OF COCKEY AND SMITH'S PATENT SELF-ACTING BYE-PASS VALVES.

Estimates for any description of Gas Plant on application.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—

MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

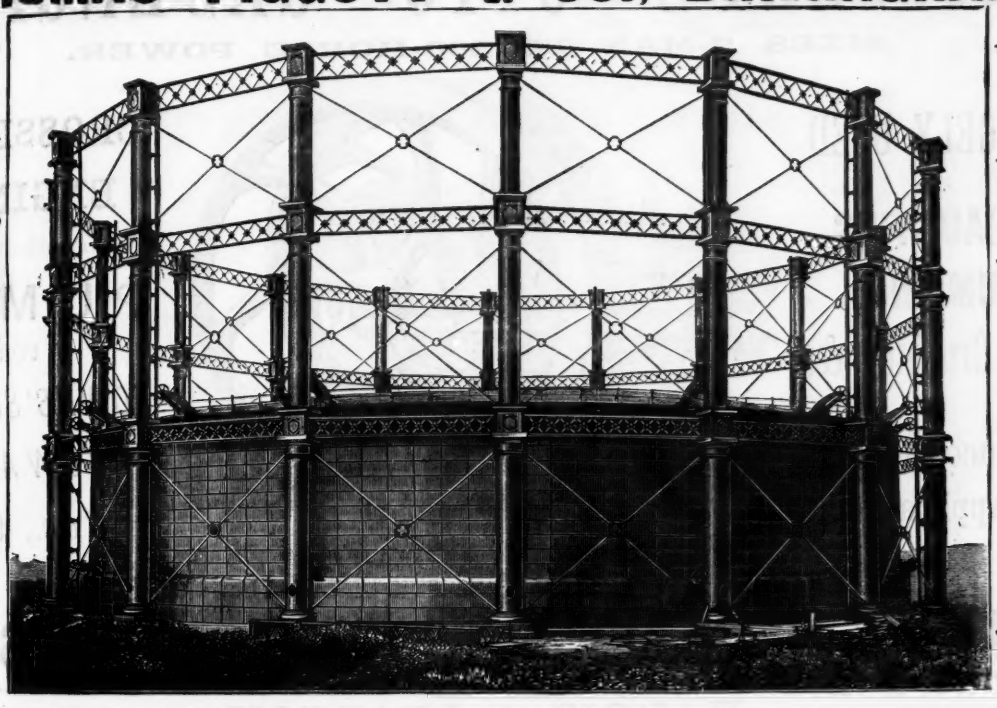
SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 168, Southwark Street. BIRMINGHAM: 114, Colmore Row. LEEDS: 6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED PIPES, FOUL MAINS, RETORT LIDS, WROT & CAST TANKS, PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

BATH.	BOLTON.	BRISTOL.	CHELTENHAM.	LEAMINGTON.	PRESTON.	SHEFFIELD.
BELFAST.	BOMBAY.	BRISBANE.	HARTLEPOOL.	LIVERPOOL.	READING.	STOCKHOLM.
BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
BIRMINGHAM.	BRIGHTON.	COVENTRY.	LEICESTER.	OLDHAM.	SOUTH METRON.	VIENNA.

GAS COAL.

BEST

REAL OLD SILKSTONE GAS COAL,

Address THE STRAFFORD COLLIERIES COMPANY,

Near BARNSLEY, SOUTH YORKSHIRE.

NEWTON, CHAMBERS, & CO., LIMITED

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES, WITH RACK & PINION, OR Internal or External SCREWS, of all Sizes.

GASHOLDERS, AND Gasholder Tanks.

CAST-IRON RETORTS,

RETORT-BED FITTINGS,

And Retort-House Appliances

of every description.

Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

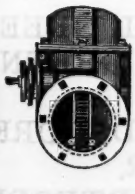
WROUGHT AND CAST IRON CONDENSERS, SCRUBBERS, & WASHERS,

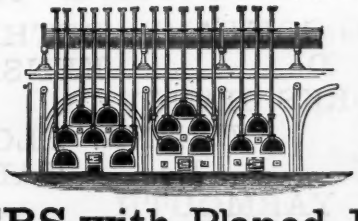
TAR AND LIQUOR PUMPS, &c.

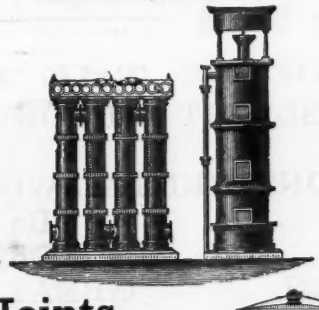
PATENT CENTRE VALVES

for working Purifiers.

Also Bye-Pass & Stop Valves.







PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.

DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

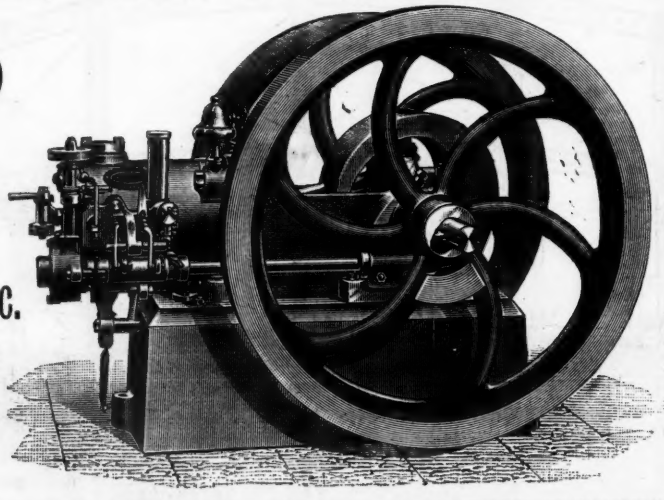
GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

SIZES, 2-MAN TO 200-HORSE POWER.

LARGELY USED
FOR
EXHAUSTING,
PUMPING,
Coke Crushing, &c.

Reduced Prices on Application.



CROSSLEY'S ENGINES,
Combined with
PUMPS
FOR
TOWNS' SUPPLY,
SEWAGE,
&c., &c.

CROSSLEY'S NEW HIGH-SPEED ENGINE FOR DIRECT ELECTRIC LIGHTING.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.

HARRIS & PEARSON,
STOURBRIDGE, ENGLAND.
MANUFACTURERS OF
FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.
GLAZED BRICKS AND PORCELAIN BATHS.

AVOID ACCIDENTS TO GASHOLDERS THROUGH FROST

BY ADOPTING

CUTLER'S PATENT FREEZING PREVENTER.

ADOPTED AT THE FOLLOWING WORKS:—

LONDON. GASLIGHT and COKE COMPANY, BETHNAL GREEN.
Do. Do. Do. KENSAL GREEN.
IMPERIAL CONTINENTAL WORKS, HANOVER.
Do. Do. Do. VIENNA. FLORIDSDORF.
Do. Do. Do. Do. TABOR.
COPENHAGEN. GREAT YARMOUTH. HERTFORD.
KING'S LYNN. BROMLEY (Kent). WARWICK.
KINGSTON-upon-HULL. RICHMOND (Surrey).

16, GT. GEORGE ST., WESTMINSTER, S.W.

S. CUTLER & SONS,

PROVIDENCE WORKS, MILLWALL, LONDON.

JOSEPH CLIFF & SONS,

INCORPORATED IN THE LEEDS FIRE-CLAY COMPANY, Ltd.,

WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS HUNSLET. LEEDS

LONDON OFFICE: 60, QUEEN VICTORIA STREET E.C.

CLAYTON SON & CO. LTD.

MAKE A SPECIALTY OF GASHOLDERS

AND MAKERS OF **GAS PLANT** OF EVERY DESCRIPTION.

REG? TELEGRAPHIC ADDRESS: "GAS LEEDS"

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND DISTRICT OFFICE: 22, TEMPLE ST., BIRMINGHAM—SOLE AGENT: A. C. SCRIVENER.

TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.

TELEGRAPHIC ADDRESS: "PARKER LONDON."

R. & J. DEMPSTER,

ENGINEERS, IRONFOUNDERS, & CONTRACTORS,

GAS PLANT WORKS,

NEWTON HEATH, MANCHESTER.

BATTERY

OF

THREE DOUBLE-ACTION

Pumps

DRIVEN FROM

ONE STEAM-ENGINE.

The Pumps are provided with suitable Valves for pumping Ammoniacal Liquor, Tar, and Water; and each is provided with Disengaging Gear, in order that any one can be stopped or started while the Engine is in motion.

Telegrams:
"Gastoves," Warrington.

TEMPORARY LONDON OFFICES & SHOW-ROOMS: 65 & 66, BASINGHALL STREET, E.C.
Winners Nelson Test, June 2, 1891; Nottingham Medal, Nov. 28, 1891.

GAS COOKING RANGES
Richmond & Co Limited
GAS FIRES
Heating Stoves
WATER HEATERS
BOILING BURNERS
GAS ENGINEERS

WARRINGTON & LONDON.
E. W. T. Richmond, Managing Director. Sole Agents for Webb's Lamps.

Heating-Stoves and Gas-Fires.

BEST VALUE IN THE TRADE. MANY SPECIALITIES.

Best for Hiring-Out. No Sheet-Iron Parts

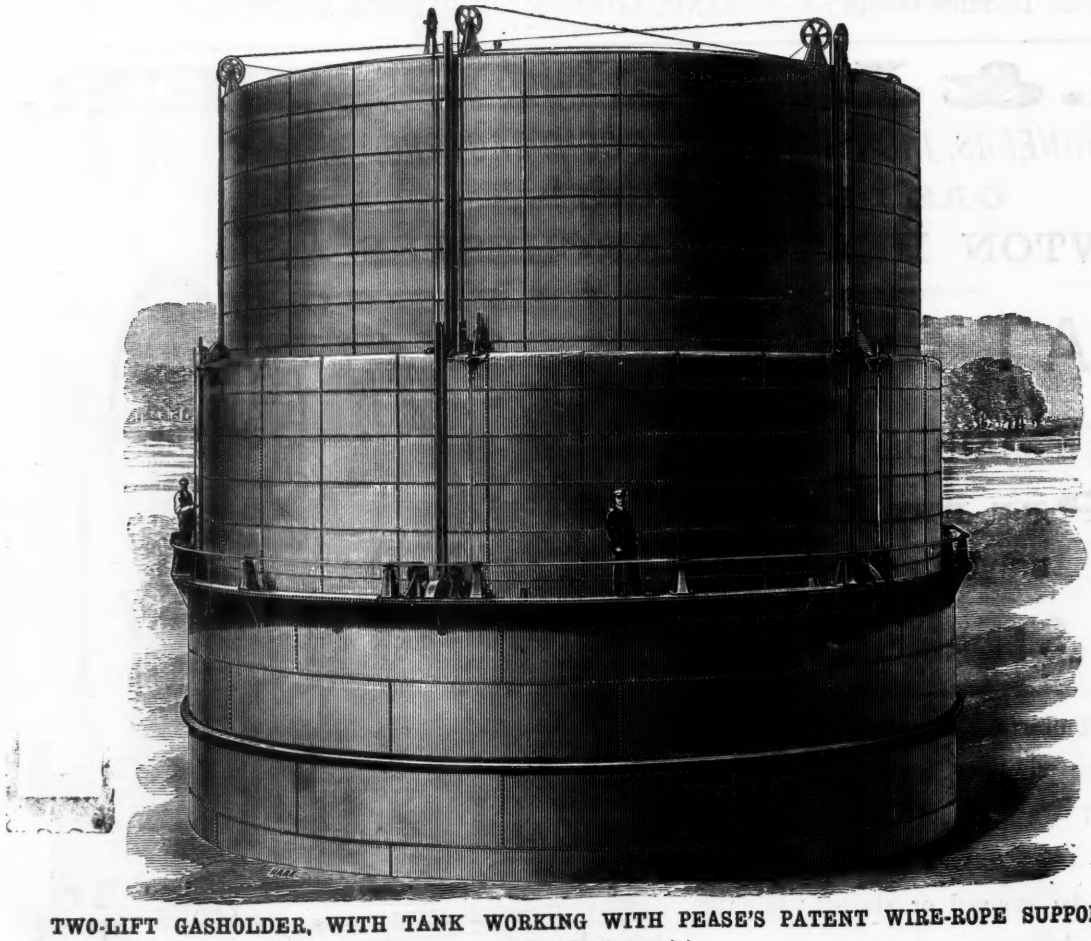
SEND FOR LIST.

SEASON 1892. NEW IMPROVEMENTS TO COOKERS. RICHMOND'S PATENT WHITE ENAMELLED STEEL CROWN PLATE NOW ADDED AT LOW PRICE.

No. 30, 2/-. | No. 40 & 50, 2/6. | No. 100, 3/-. | No. 120, 3/6. | No. 140, 4/-. | No. 160, 5/- sub.

ASHMORE, BENSON, PEASE, & CO., LTD.,

STOCKTON-ON-TEES.



TWO-LIFT GASHOLDER, WITH TANK WORKING WITH PEASE'S PATENT WIRE-ROPE SUPPORTS.
(From Photograph.)

IMPORTANT TO ENGINEERS AND GAS COMPANIES.

A NEW CARBURETTOR FOR ENRICHING GAS IN BULK.

Used by the largest Gas Companies in London, and entirely superseding the use of Cannel Coal.

For Price and Full Particulars, apply to

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

FRANK W. CLARK, Engineer,

48, SUFFOLK HOUSE, LAURENCE POUNTNEY HILL, E.C.

PREPAYMENT GAS-METER.

(PRICE'S PATENT.)

This Meter has a simple Automatic arrangement fitted, whereby, upon the insertion of a shilling, a supply of gas can be obtained, and which is cut off on the quantity paid for being consumed. The Meter gives warning when the quantity is nearly exhausted, so that another shilling may be inserted. There is, however, no occasion to wait until this happens, as a second shilling can be inserted after two-pennyworth of the first shilling has been consumed.

The Meter is fitted with the ordinary registering dial, and has in addition a circular one divided showing twelve pence. On each Meter is marked the number of cubic feet it will pass for one shilling; and this can be arranged to cover cost of Meter-Rental, Fitting, and Gas consumed. These Meters are made of the best material and workmanship.

SPECIALLY ADAPTED FOR INCREASING CONSUMPTION AMONGST SMALL CONSUMERS.
NO RISK OF BAD DEBTS.

PROPRIETORS AND MANUFACTURERS:

D. HULETT & Co., LIMITED,

GAS-METER MAKERS, 55 & 56, HIGH HOLBORN, LONDON.

W. C. HOLMES & CO.,

CONTRACTING GAS ENGINEERS.

THE

PATENT ROTARY

Scrubber-Washer,

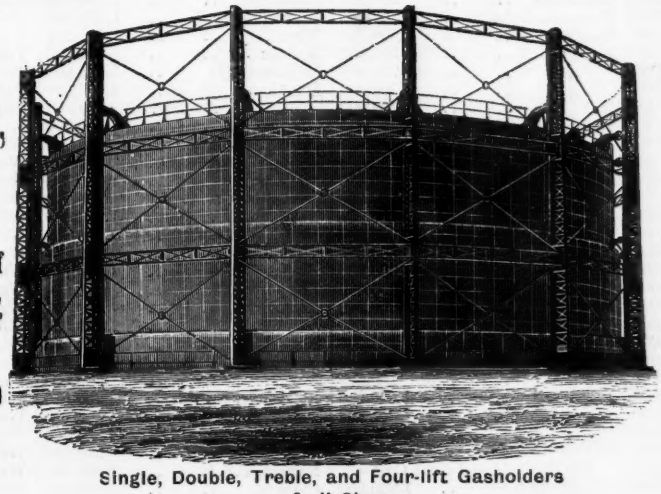
With recent improvements.

Sizes from 50,000 *to* 5,000,000 *feet per day.*

Guaranteed larger area of wetted surface, size for size, than that of any other Maker.

RESULTS UNAPPROACHED BY ANY OTHER SYSTEM.

Send for References.



Single, Double, Treble, and Four-lift Gasholders of all Sizes.

"Saville's" Patent

COMBINED EXHAUST REGULATOR & TAR EXTRACTOR,

Perfectly automatic, and cannot get out of order. Prices low. All particulars on application.

Retort-Settings, Condensers, Scrubbers, Purifiers, and all Fittings for Gas-Works.

WHITESTONE IRON-WORKS,

HUDDERSFIELD,

AND

80, CANNON STREET, LONDON, E.C.

For Telegrams: "Holmes Huddersfield."

For Cablegrams: "Ignitor London."

KIRKHAM, HULETT, & CHANDLER, LIMITED.

[SIDNEY HERSEY, Managing Director.] [J. CHANDLER, Engineer.]

436 Patent "Standard" Washer-Scrubbers,

Capable of extracting the whole of the Ammonia from 410,680,000 Cubic Feet of Gas per 24 hours.

Erected and in course of construction at present date, amongst them being the following, viz.:—

	Capacity. Cubic feet per day.
Altrincham	600,000
Adelaide	600,000
Aldershot	200,000
Allegheny, U.S.A.	1,000,000
Ashton-under-Lyne	1,250,000
Amsterdam (2)	1,500,000
Annaberg	200,000
Arcachon	100,000
Animal Charcoal Co.	200,000
Altoona, U.S.A.	350,000
Buxton	250,000
Bradford (3)	1,000,000
„ (3)	1,250,000
„	3,000,000
Bremen	150,000
Baltimore, U.S.A. (3)	1,000,000
Balmain, N.S.W.	125,000
Bishops Stortford	150,000
Blackpool	400,000
Brussels (3)	1,250,000
„	750,000
Banbury	250,000
Birmingham (2)	5,000,000
Birkenhead	2,500,000
Blackburn	1,500,000
Bochum	600,000
Burntisland	250,000
Boston, U.S.A.	2,000,000
Brisbane	1,500,000
„	300,000
Burton-on-Trent	1,500,000
Barcelona	350,000
Barking	100,000
Baerlien & Co. (2)	20,000
Bombay	700,000
Buffalo, U.S.A.	550,000
„	500,000
Brooklim, U.S.A.	300,000
Bergen	250,000
Berlin	150,000
Bournemouth	1,000,000
Bridgeport, U.S.A.	500,000
Brunswick	300,000
Beck & Co., St. Louis	100,000
Barmen Rittershausen	600,000
Bexhill	125,000
Brooklyn, U.S.A. (2)	1,000,000
Brunner, Mond, & Co.	400,000
Cheltenham	2,000,000
Cannes	200,000
Croydon	1,500,000
Copenhagen	200,000
Clevedon	200,000
Columbus, U.S.A.	500,000
Cincinnati, U.S.A. (2)	1,500,000
Chicago, U.S.A.	3,000,000
„ (2)	1,000,000
Chemnitz	1,000,000
Crewe	1,250,000
Colonial Gas-Works Co.	100,000
Cadiz	300,000
Charlottenberg	600,000
Dudley	750,000
Driffield	100,000
Dukinfield	500,000
Dover	750,000
„ (2)	1,000,000
Deal	200,000
Derby (2)	1,500,000
„	1,000,000
Dublin	3,000,000
Dowlais	100,000
Douai	500,000
Denton	500,000
Derby, U.S.A.	350,000
Denver, „	500,000
„ „	1,000,000
Düsselldorf	750,000
„	500,000
Dumfries	250,000
Dunedin, N.Z.	400,000
Darlington	1,250,000
Detroit, U.S.A.	750,000
Edinburgh	1,500,000
„	2,000,000
Enfield	300,000
Essen	300,000
Elbing	150,000
Falmouth	150,000
Frankfort	300,000
Farnworth	400,000
Fenton	400,000
Friedenshütte	500,000
Fürth	400,000
Freiburg	200,000
Goole	250,000
Glossop	300,000
Guildford	300,000
Gloucester	1,250,000
Gera	300,000
Grafton, N.S.W.	100,000
Grieg	300,000
Georgetown, U.S.A.	250,000
Gluckauf	200,000
Heywood	600,000
Holywood	125,000
Huy	70,000
Harrow	250,000
Harrogate	250,000
Halstead	150,000
Heilbronn	200,000
Havanna, Cuba	750,000
Hastings	1,500,000
Huddersfield	300,000
„	750,000
„	1,500,000
Hof	200,000
Hampton Wick	500,000
Heckmondwike	500,000
Haverfordwest	100,000
Halifax, N.S.	350,000
Hamm	200,000
Halle	400,000
Heidelberg	300,000
Hartford, U.S.A.	1,000,000
Ilkeston	300,000
Inverness	250,000
Ilkley	200,000
Ilford	100,000
Kingston-on-Hull	400,000
Kidderminster	750,000
Kidsgrove	100,000
Königsberg	1,000,000
King's Lynn	300,000
LONDON :—	
The Gaslight and Coke Co. :—	
Beckton (6)	1,250,000
„ (2)	2,500,000
Silvertown	1,000,000
LONDON—*Continued.*	
The Gaslight and Coke Co. :—	
Bromley (2)	2,000,000
„ (4)	1,500,000
Shoreditch	2,500,000
Pancras (2)	1,500,000
Pimlico	2,000,000
Nine Elms (2)	3,000,000
Kensal Green (2)	3,000,000
South Metropolitan Co. :—	
Greenwich	3,000,000
Woolwich	400,000
Vauxhall (2)	3,000,000
Lea Bridge	300,000
West Ham	1,500,000
„	3,000,000
Leeds (2)	2,000,000
„ (4)	3,000,000
Leominster	150,000
Leiden	560,000
„	600,000
Liverpool (5)	2,000,000
„ (4)	3,000,000
Lincoln	1,000,000
„	600,000
Lowell, U.S.A.	1,000,000
Laclede, „	1,000,000
Louisville, „	1,500,000
Long Eaton	500,000
Lille	900,000
„	450,000
„	750,000
„ (2)	250,000
Luckenwalde	330,000
Liegwitz	300,000
Lincoln, U.S.A.	250,000
Lawrence, „	500,000
Lynn, „	300,000
Lyons	1,500,000
Maidstone	1,000,000
Marseilles (2)	1,500,000
Mons	500,000
Malines	250,000
Melbourne (5)	1,500,000
Manchester (2)	2,500,000
„	400,000
Middleton	400,000
Manley, N.S.W.	100,000
Minneapolis, U.S.A.	750,000
Magdeburg	300,000
Memphis, U.S.A.	750,000
Nottingham	1,250,000
„ (2)	2,500,000
„ (2)	2,000,000
„	1,500,000
Newport, U.S.A.	430,000
Newmarket	150,000
Newark, U.S.A.	680,000
Northfleet	200,000
New York, U.S.A.	2,000,000
Nice	600,000
Newcastle, N.S.W.	200,000
Numea, „	100,000
Namur	250,000
Newark	350,000
Nassau, U.S.A.	1,000,000
Oldbury	500,000
Otley	200,000
Oswestry	250,000
Ober Schlesian	1,500,000
Otto & Co.'s Coke Works	1,500,000
Plymouth	2,000,000
Parramatta, N.S.W.	100,000
Prescot	150,000
Providence, U.S.A. (2)	750,000
Plauen (2)	300,000
Portsmouth (2)	2,500,000
Pittsburg, U.S.A.	1,500,000
Portland, „	560,000
Pawtucket, „	500,000
Quebec	250,000
Radcliffe	750,000
Rouen	250,000
Ramsgate	1,000,000
Reigate	200,000
Richmond, U.S.A.	250,000
Roxbury, „	500,000
Runcorn Soap Co.	20,000
Rockhampton, N.S.W.	125,000
Richmond	1,500,000
Reading	2,000,000
Reichenbach	200,000
Smethwick	750,000
Sydney, N.S.W. (2)	1,000,000
„	2,500,000
Sunderland	1,500,000
St Joseph's, U.S.A.	250,000
Spa	100,000
Sevenoaks	300,000
St. Petersburg	2,000,000
„	1,500,000
St. Louis, U.S.A. (2)	2,000,000
„	1,000,000
Silesian Coal Co.	600,000
San Francisco, U.S.A. (2)	2,000,000
Sheepbridge Coal Co.	40,000
Stettin	200,000
Singapore	300,000
Sutton	500,000
Tonbridge	150,000
Tipton	400,000
Tottenham	1,000,000
Toledo, U.S.A.	750,000
Toronto	1,000,000
Uxbridge	300,000
Valparaiso	500,000
West Bromwich (2)	1,000,000
Willenhall	250,000
Weston-super-Mare	500,000
Waltham	150,000
Wormwood Scrubs	300,000
Williamsburg, U.S.A. (2)	600,000
Wellington	150,000
Warwick	300,000
Wheeling, U.S.A.	500,000
Walker	300,000
Westgate	100,000
Wilmington, U.S.A.	500,000
Windsor, N.S.W.	100,000
Wolverton	100,000
Wellington, N.Z.	250,000
Whitchurch	175,000
Washington, U.S.A.	2,000,000
Wallasey	750,000
Weimar	150,000
Wurzen	200,000
Worcester, U.S.A.	750,000
Yeadon	500,000
Yeovil	250,000

All New Patent "Standard" Washer-Scrubbers are fitted with the Company's Patent Improved Wooden "Bundles" or Washing devices, which can be readily fitted to old pattern Machines.

Address: 3 & 4, Palace Chambers, Bridge St., Westminster, London, S.W.

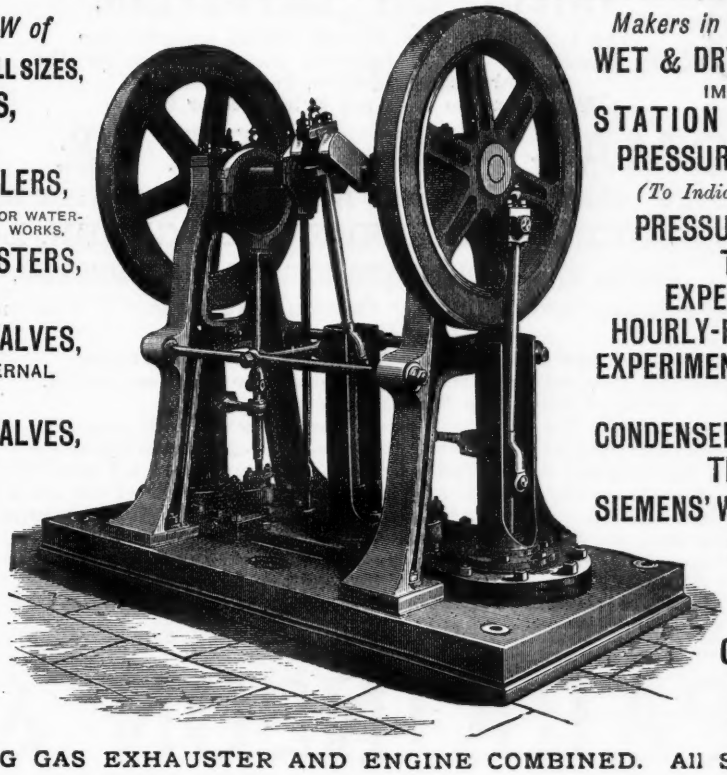
R. LAIDLAW & SON,

GAS AND WATER ENGINEERS.

Manufacturers of **GAS APPARATUS** of every Description.

Makers in GLASGOW of

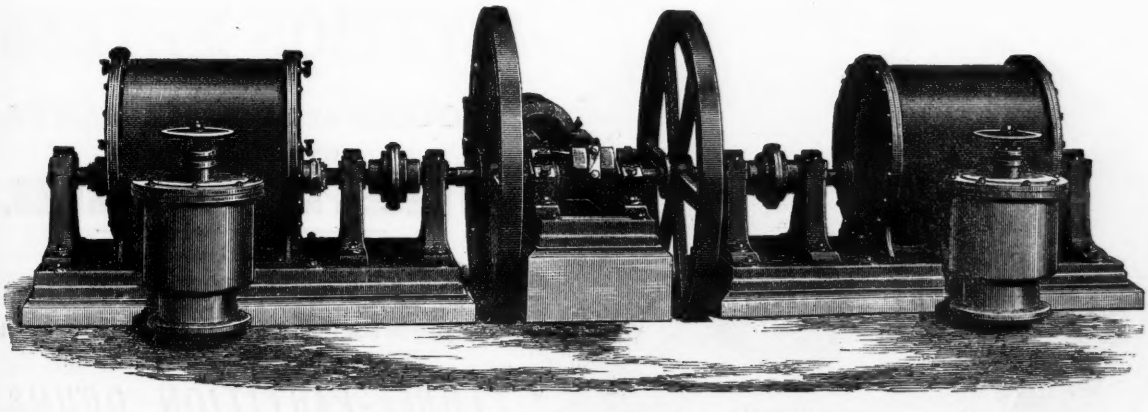
CAST-IRON PIPES, ALL SIZES,
LAMP PILLARS,
STEAM-ENGINES AND BOILERS,
PUMPING ENGINES FOR WATER-WORKS,
BEALE'S GAS EXHAUSTERS,
DOUBLE-FACED SLUICE VALVES,
INTERNAL AND EXTERNAL RACK OR SCREW SLIDE VALVES,
CAST-IRON COLUMNS,
BEAMS, GIRDERS, AND WATER-TANKS,
WROUGHT-IRON TUBES, FITTINGS, &c.



Makers in EDINBURGH of

WET & DRY GAS-METERS,
IMPROVED STATION GOVERNORS,
PRESSURE REGISTERS
(To Indicate Now Time),
PRESSURE GAUGES,
TEST HOLDERS,
EXPERIMENTAL HOURLY-RATE METERS,
EXPERIMENTAL TEST METERS,
CONDENSER THERMOMETERS,
SIEMENS' WATER-METERS,
STREET LANTERNS,
And all Kinds of
GAS APPARATUS AND FITTINGS, &c.

PUMPING GAS EXHAUSTER AND ENGINE COMBINED. All Sizes.



BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED. All Sizes.

Prices, with full Particulars, will be given on application.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,

INTERNATIONAL EXHIBITION, EDINBURGH 1886.

ALLIANCE FOUNDRY, **GLASGOW.** | SIMON SQUARE WORKS, **EDINBURGH.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

And at 37, BLACKFRIARS STREET, MANCHESTER.

TELEGRAPHIC ADDRESSES: "GOTHIC LONDON," "GOTHIC MANCHESTER." TELEPHONE No. 6725.

1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
5th—Are the most accurate and unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.
Are upheld for five years without charge.

W. PARKINSON & CO.

STATION METERS

IN

ROUND or SQUARE TANKS,

FITTED WITH PATENT

THREE-PARTITION DRUMS.

MORE THAN

300 STATION METERS,

Varying in size from 1200 to 200,000 cubic feet per hour, have been sold, fitted with

THREE-PARTITION DRUMS,

Since their introduction.

ROUND METERS as above are kept in Stock in all Sizes ready to send away at the shortest notice. Compact, portable, and very easily fixed. An Improved Overflow Water-line Regulator fitted to every Meter.

DURABILITY UNEQUALLED. SOME HAVE BEEN IN CONSTANT USE FOR OVER 60 YEARS

COTTAGE LANE WORKS, CITY ROAD,
LONDON.
Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegraphic Address: "GAS-METERS."

OFFICE: 10, MAWSON'S CHAMBERS, DEANSGATE,
MANCHESTER.
Telegraphic Address: "PRECISION."

[See also Advt., p. 317.

CONTENTS.

EDITORIAL NOTES:— PAGE

GAS, LIGHTING, &c.—
A Strike of Coal Porters . . . 287
The Disposal of Chartered Residuals . . . 288
Fog in the House of Lords . . . 289

ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market . . . 289
Electric Lighting Memoranda . . . 289
The Electrical Exhibition—Second Notice . . . 290

COMMUNICATED ARTICLE:—
Lighting. Part III.—A Critical Examination of Modern Practice. By W. H. Y. Webber . . . 292

TECHNICAL RECORD:—
A Portable Photometer for Measuring Street Lights and Illumination in General . . . 293
The Effect of Impure Materials in the Amyl-Acetate Lamp . . . 295
Gas *v.* Steam Engines for Motive Power . . . 295
The Production of Ammonia, Tar, and Heating Gas . . . 296

CORRESPONDENCE:—
The Composition of the South Metropolitan Company's Gas . . . 297
Lighthouse Illumination and the Stranding of the *Eider* . . . 297
Service or Distributing Reservoirs, and the Necessity for Covering Them 298

PARLIAMENTARY INTELLIGENCE:—
House of Lords—Fog and Smoke Abatement . . . 299
House of Commons—Lighthouse Illumination; Bills to Originate in the House of Lords . . . 299

LEGAL INTELLIGENCE:—
Supreme Court of Judicature—Court of Appeal—Ungar *v.* Sugg . . . 299
County of London Assessment Sessions—Judgment in The Gaslight and Coke Company's Assessment Appeals . . . 299

MISCELLANEOUS:—
Brentford Gas Company—Half-Yearly Report and Accounts . . . 300
Bromley Gas Consumers' Company—The Half-Yearly Report and Accounts 300
Newcastle and Gateshead Gas Company—Annual Report . . . 301
Provincial Gas and Water Companies . . . 301
Bradford Corporation Gas and Electricity Supply—The Financial Position of the Departments . . . 302
Wigan Corporation Gas and Water Supply—Committees and their Capital Expenditure . . . 303
Brighouse Local Board Gas Supply—Proposed Extension of the Works . 303
The Dangers of Mineral Oils . . . 304
Electric Lighting for Portsmouth—The New Scheme Agreed to . . . 304
Electric Lighting by Gas Companies in the Colonies—The Rockhampton (Queensland) Gas Company's Electric Lighting Scheme . . . 304
Lincoln Corporation Water Supply . . . 305
Meeting of the Beyrout Water-Works Company, Limited . . . 305
Notes from Scotland . . . 305
Current Sales of Gas Products . . . 306
Coal Trade Reports . . . 306
Gas and Water Companies' Stock and Share List . . . 307

PARAGRAPHS.—The Governor of The Gaslight and Coke Company and the Price of Gas in Cambridge, 289—Dr. Ballard, F.R.S., 290—Illuminating Flames, 290—Southern District Association of Gas Engineers and Managers, 291—The "Electrical Trades' Directory and Handbook for 1892," 291—The Petroleum Production of the United States in the Past Year, 291—Is Electricity a Manufactured Product? 291—Royal Masonic Institution for Boys, 293—Death of Mr. John Wright, 294—Honours for French Gas Engineers, 294—The Management of the High Wycombe Gas Company, 296—Mr. Richard Williams, 296—"Nos Eclairages," 296—Flame Coloration, 296—Mr. D. D. Wilson, 297—Messrs. Fletcher, Russell, and Co., Limited, 297—Oil-Lamp Accidents, 298—The Quality of the Gas at Middlesbrough, 298—Cagliari Gas and Water Company, 298—Sales of Shares, 300—Opposition to the North Shields Water Bill, 302—Sale of the Holt Gas-Works, 304—Electric Lighting for Blackburn, 304—The Smethwick Gas Undertaking, 304—A New Water Reservoir for Wakefield, 304—Exhibition of Gas Appliances at Darlington, 304—Business Change, 305—A New Gasholder for Swansea, 305—Gas Meter Inspectors' Dinner at Liverpool, 306—Reduction in the Price of Gas at Doncaster, 307—Accident at the Wolverhampton Gas-Works, 307—Electric Lighting at Hawick, 307—The Gas Question at Eccles and Swinton, 307—New Offices for the Ipswich Gaslight Company, 307—Business Transfer, 307—Morris and Cutler's Patent Condenser, 307.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but Orders for Alterations in or Stoppages of PERMANENT ADVERTISEMENTS should be received Not Later than the FIRST POST on SATURDAY.

Telegraphic Address: "GASKING LONDON."
Telephone Number: 2789.

THE
JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 16, 1892.

A Strike of Coal Porters.

LIKE the traditional thunderbolt from a clear sky came the announcement in last Thursday's newspapers that a strike of coal porters had begun in London the previous morning, which, it was fully expected, would affect some 10,000 men. There was the usual uncertainty as to the real reason for the men coming out; but it was at least clear that the strike was a trial of strength between the men's Union and the employers. It appears that there has been friction of the usual kind for some time past between the Union men and the masters; several "Branch Executives" having ordered their members not to work with non-unionists, and also to refuse to load vans for carmen in arrears with their subscriptions. It hardly needed an inspired article in the *Daily Chronicle*—a newspaper that always favours the Union side—to assure the general public that members of the Union who have fallen in arrear with their subscriptions constitute a class that Union wire-pullers are "particularly incensed against." Of course they are, for such cases are the dry-rot of all such organizations. This same newspaper informs us that "the Union had laid it down in their last notice to "their members that, whilst they would not refuse to "work with non-unionist men, *should their members refuse at "any time to work with men* who, having joined the Union, "refused to comply with the rules concerning keeping "their subscriptions paid up, *the Council of the Union would "sustain and defend the men* in any such action." The italics are ours. After a considerable amount of practice in construing Trade Union proclamations, we do not hesitate to aver that this was meant to be a provocative notice. It placed the initiative with the men, but left them no choice in the matter. An opportunity soon arose for proving that the permissive turn of this memorandum would be read as an imperative. A certain firm of coal merchants, trading under the name of F. B. Cameron and Co., dared to employ a backsliding unionist foreman who had not cleared his card; and upon the men (who had communicated with their leaders respecting the matter) refusing to work under him, in obedience to instructions, they were forthwith discharged. At the same time, in accordance with well-known Union tactics, another quarrel was picked with the firm over a petty question of taring empty sacks; and thereupon the President and Secretary of the Union opened up negotiations with the firm—of course, claiming to be solicitous to do all in their power "to bring about a settlement of the dispute." What amount of good faith there may be in this claim will appear by reference to their responsibility for the issue of the provocative notice that caused all the trouble. Just at this juncture, the Secretary of the Coal Merchants' Society issued a warning to the members of what was going on at Cameron's yard; and this, it is pretended, gave such mighty offence to the Union leaders, that, after a "special delegate meeting," which sat, with dramatic effect, all night, the order went forth for a general strike of Union hands. We are assured that "long and anxious "were the deliberations" of these gentry "as to how far "they would be justified in virtually stopping the coal "supply of London, and as to how far they would be "supported by public opinion if that course were "taken." Just so. It would never do to appear to precipitate with a light heart the strife between Union tyranny and free labour. But the whole thing had evidently been cut and dried; and at six o'clock in the morning it was announced by the Secretary "that those who had not gone "into work should not do so, and those who had gone in "should be fetched out." The order, we are informed, was received with a "mighty cheer." This is as usual; the unreflecting majority are always in favour of violent measures. Before another day had passed, a unionist carman had been sent to prison for seven days for assaulting a freeman; the Magistrate remarking, for the general instruction, that for the present, at any rate, and while the law of the land remains unreformed upon Trade Union principles, every "man has a right to work when "he likes, for whom he likes, and how he likes," and he is not to be interfered with in exercising this liberty.

So the strike opened, and appeared to be going on in the usual way. Whatever the issues ostensibly raised for the sake of attracting the support of the public, the true point was nothing more than the old one of who is to order how work is to be done—the employer or the Union. The Coal Porters had been pretty quiet for the last three years; and they imagined themselves strong enough to fight the question once more. They succeeded in disorganizing the retail coal trade of London for a few days; and while the poor people found coal unattainably dear, gas and electric light companies had their supplies stopped for a time. The men, of course, professed to be "hopeful and determined;" and, just as in the disastrous South Metropolitan gas stokers' strike, their stump-orators tickled them with assurances that "the

"blacklegs cannot do the work." It was evident, however, if the employers stood firm, and the Union did not give up the struggle, that history would repeat itself. The already congested labouring population of London would be increased by importations of men from the country, who in a few weeks would make as efficient coalies as those who were being converted into street-corner bullies and mendicants to satisfy the demands of Messrs. Brill and O'Connor. The Union funds would soon be exhausted; and then the strike would collapse. As *The Times* put it, this time the men who had come out by the orders of the Union Executive had "no quarrel with their masters, "and no grievance to redress." It was a strike "not got "up in the interest of the men, nor by the wish of the "men, who were never consulted, and knew nothing at all "about the matter." How long this species of oppression is to be permitted it is for working men themselves to say. When a clear majority of the men of any trade agree by ballot to strike for some definite object, having seen their way and counted the cost, there is nothing to be said. But while ignorant men place absolute power over their own livelihood in the hands of men entirely irresponsible and utterly unfit to use it, we must expect to see a continuance of such scandals as we now witness.

As was expected would be the case, the strike has practically collapsed. The manner of its cessation is as instructive as that of its initiation. Although hysterically applauded by the London newspapers which follow the cue of flattering the Labour Party, whether right or wrong, such as the *Daily Chronicle*, the *Star*, and the *Trade Unionist*, forty-eight hours' experience of the realities of an arbitrarily-ordered strike was enough to convince the wire-pullers that they had made a mistake. The Union was "well organized," as Tom Mann gleefully testifies, to the extent that the men came out when summoned by their delegates; but no sooner had they stopped work than the futility of the whole proceedings became manifest. Not only did the idleness of all the unionist coalies of London fail to overawe the single firm of dealers who had originally offended the Union, but, to the disgust of the latter, the other employers elected to make common cause with this firm; evidently perceiving that, if the Union chose to raise the question of freedom to labour, the issue might as well be fought out now as at any future time. Moreover, lawlessness was most sternly suppressed. The first rioter had seven days' imprisonment for an assault upon a free carman; the next was sent up for three weeks. Meanwhile, free labour was merrily pouring in; and the police insisted on keeping the peace. So even the hare-brained instigators of the strike and their too-willing dupes saw that the "game was up;" and, after a vain attempt to induce the employers to withdraw the notice proclaiming their intention to maintain the freedom of labour, the leaders unconditionally gave in, and the great strike "upon principle," which began on Tuesday, and was to have been persevered in until the cause of the New Unionism triumphed all over London, collapsed on the following Friday. By some mysterious process, the *Daily Chronicle* sees in this termination a "victory for the men;" but it is pretty clear to the men themselves that a few more days of such "victory" would have left them starving. As it is, the determination of the masters to employ whom they please, without reference to the Union, has made some of the unionists regret the strike; for when the men wanted to go in on Saturday morning, they found in many instances their places taken. Altogether, and although this ridiculous strike only lasted so short a time, it is clear that it has inflicted a blow upon the cause of the New Unionism from which the latter—already discredited by many failures—will with great difficulty recover. Bluster as they may, the leaders cannot deny that their followers have had to return to work on exactly the same terms as prevailed before the strike; and that the attempt to bar the employment of free labourers has not only failed, but that, if any men have lost their berths, it has been through the action of the Union. Their friends in the Press have agreed to make the fall soft for the Union officials; but the fall is undeniable.

It is proverbially difficult to see the end of strife, and the last thing before going to press we learn that Friday's so-called "settlement" has been rejected by a considerable section of the men who are employed in what is known as the "seaborne branch." Possibly this mutiny in the ranks of what has been held forth for general admiration as a "splendidly organized" Union, means little more than a determination on the part of some of the men to keep "Saint Monday" before returning to work. Some observers, however, regard the split in the ranks of the unionists as so serious, that the Union can hardly recover. It is reported that, in staying out yesterday, the "seaborne" men openly broke with the Union Executive, and that most of them tore up their cards. Moreover, among the men who stay out and those who have returned to work great dissatisfaction is felt because no strike pay was forthcoming at St. Pancras on Saturday. The whole affair shows how perniciously the New Unionism works for all concerned, and how little reliance is to be placed upon the organization of these societies for rough "trades" for effecting anything but mischief. The London coalies seem to have been particularly unfortunate, for their first leader was the notorious Michael Henry, who found it expedient to vanish after his historic interview with the heads of The Gaslight and Coke Company; and now they have been "left in a hole" by Henry's successor. It is worthy of mention that, although the block upon coal at St. Pancras only lasted three days, the St. Pancras electric lighting station was placed in great difficulties; and if it had endured for a week at all the depôts of coal, more than one of the London electric lighting companies would probably have had to shut down, unless they could have fired up their boilers with gas coke. Since it is an ill wind indeed that blows nobody good, it is satisfactory to learn that the coal block gave a much-needed impetus to the coke trade in all parts of London.

The Disposal of Chartered Residuals.

INQUIRIES have been addressed to us, by correspondents whose connection with the trade in gas-works residuals is too close to admit of their raising the question in their own names, with respect to an incident of The Gaslight and Coke Company's meeting to which passing reference was made in our editorial notice of the proceedings, but which is not mentioned at all in our condensed report of the speeches delivered on this occasion. The reference was to the remarks of the Governor (Colonel Makins), in reply to an inquiry of Sir F. Mappin's, which we characterized as "twitting Sir F. Mappin with the alleged "unfavourable returns for sulphate of the Sheffield "Company." Naturally enough, it may be asked what these words mean, seeing that there is not a word in our report of the proceedings on the subject of the dealings in sulphate of either The Gaslight and Coke or the Sheffield Company. It is necessary to explain, therefore, that the observations of the Governor and Sir F. Mappin on this subject were not suppressed by our reporter for any other reason than that of his general instruction to condense the abstract which he prepares for our columns. We do not profess to give verbatim reports of company meetings; and it must occasionally happen that, in the process of condensation, some of the remarks that are bandied across the table on these occasions escape recording. In view of the undoubted importance of Sir F. Mappin's point, however, and also in order to explain the editorial reference, we now return to the subject, and give the incident all the prominence in our power. What occurred was this: In the course of his speech, Sir F. Mappin asked the Governor if it is true, as rumoured, that the Chartered Company's make of sulphate is sold through one broker, who also buys on his own account. If so, Sir F. Mappin opined that this would explain the depreciation in the market value of this commodity. In reply, the Governor stated that the Company do not sell sulphate through any broker, but only through the agent of the Company, who never buys an ounce or a ton for himself. With his usual smartness in defence, Colonel Makins carried the war into the enemy's country by asserting that the results of the Chartered practice in this regard will compare favourably with those of any other Gas Company, "and most "favourably with those of the Sheffield Company." With this the incident closed; Sir F. Mappin being disastrously routed, from the point of view of the debater, and Colonel Makins and the Chartered residuals agent remaining masters of the situation. It is not for us to offer any opinion upon the subject. The suggestion conveyed by Sir F. Mappin's question is unmistakeable. No such inquiry ought to be made in public without good foundation for raising the point; and it is to be hoped that the

reasons which induced Sir F. Mappin to take the action he did in the matter will be further explained at the first opportunity.

Fog in the House of Lords.

THE inevitable fog debate, which has become one of the "hardy annuals" of the House of Lords, came earlier than usual this year, on the motion raised by Lord Midleton last Friday for a Royal Commission to inquire into the subject. The matter will be found briefly chronicled in our "Parliamentary Intelligence to-day." The Marquis of Salisbury, who seems to have succeeded Lord Derby in the professorship of the art of pouring cold water upon "burning questions," declined to sanction the expense and trouble of a Royal Commission, whose labours, as everybody can see, would be practically fruitless, but was ready to consent to the appointment of a Select Committee to inquire into the subject, provided Lord Midleton is willing to be the Chairman, and can get a sufficient number of other noble Lords to sit with him for such a purpose. Of course, the sovereign efficacy of anthracite as a smokeless, and therefore innocuous, fuel was postulated by Lord Midleton; and although Lord Salisbury effectively dealt with this point, which the smoke abatement enthusiast is never weary of bringing forward, it is impossible to read Lord Midleton's suggestions for rendering the general use of anthracite obligatory, without thinking of those "golden days" regretfully apostrophized by the Peers in "Iolanthe," when it could be said of the House of Lords that these "noble statesmen did not itch to interfere with "matters which they did not understand." The subject was briefly discussed once more in *The Times* in a sensible leading article, which regretfully, but unreservedly, endorsed Lord Salisbury's view of the matter. Lord Midleton's suggestions for dealing with the evil are neither new nor good. He prattled of anthracite and its qualities, and of various ways of making house chimneys less smoky than they are at present; but, as Lord Salisbury said, people will not adopt these things without coercion, and that of adrastic kind. Dealing with the same subject a short time since, our contemporary the *Engineer* confessed that anthracite would not be used for a single month in London. Writing from an experience extending over four consecutive years, with anthracite burnt in the most suitable grates, and attended by servants who perfectly understood its properties, our contemporary sums up its qualities by quoting with entire approval "the sentiment of an "American engineer who pronounces anthracite 'an "'invention of the Evil One.'" Another contemporary, *Industries*, in discussing the foregoing statements, offers the truly original suggestion that the best way to lighten the Gas Companies' burdens, which prevent them from selling cheap gas, and so render gas-fires expensive, would be "to permit the Companies, by means of a sliding "scale, to lower the illuminating power of their gas, and "to gradually introduce to their consumers a cheaper gas "which would commend itself for heating purposes to a "large class of the community." The idea is not altogether a bad one; at least, it suggests an undiscussed view of the true nature of the conditions under which the statutory illuminating power of London gas was fixed at 16 candles. We suppose that 14-candle gas, tested in a reasonable way, could be sold by the London Companies for about 4d. per 1000 cubic feet less than they are obliged to charge for the present mixture, which has to be sent out as 17-candle gas. Whether such a difference of cost would be sufficient to meet the views of the possible users of gas-fires appears to us to be doubtful. In connection with the fog question, it may be mentioned that Lord Stratheden and Campbell has once more brought forward his Smoke Abatement Bill.

The Governor of The Gaslight and Coke Company and the Price of Gas in Cambridge.—We are asked to correct a misstatement by Colonel Makins, at the recent meeting of The Gaslight and Coke Company, that the price of gas in Cambridge has been advanced 10d. per 1000 cubic feet. In June, 1871, the price was reduced to 3s. 9d.; but in the following year, owing to the coal famine, it had to be raised to 4s., at which figure it remained till the end of 1878, when the 3d. was again taken off. In June, 1879, it was made 3s. 6d. Since then it has been gradually lowered to the present figure of 2s. 10d.; and, as stated by the Chairman at the last half-yearly meeting of the Company (see *ante*, p. 256), the Directors have had "no need to increase the charge for gas," and "they did not anticipate they would have to do so."

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 307.)

So far as the general business of the Stock Exchange last week may be regarded, there was only one market—the American; but the sensational and somewhat mysterious phases of that field of surprises are not our particular concern. Everything else was tame and flat; and, owing to the recent great restriction in the scope of operations, the settlement was a mild affair. The Money Market has developed nothing new; and it remains about *in statu quo ante*. Gas has not been an active market on the whole, though towards the end of the week it was a little more animated. Movements in value were few and irregular. The Metropolitan Gas Companies showed great firmness; but some of the Foreign undertakings evinced less stability. Gaslight and Coke issues were only moderately dealt in. With the single exception of the "H" 7 per cent. limited, all issues come out higher upon *ex div.* quotations. The "A" opened in pretty good favour, and steadily improved, till it was done more than once at 224½; thus recovering the position from which it fell a month ago. The debenture stocks were firm; the 4 per cent. making an advance of 1½, and the preferences, though little dealt in, were better all round. It may be noted of them that the highest and the lowest in rank—viz., the "C" and the "K"—are priced equally; while all the rest are put at lower figures. South Metropolitans were very lightly dealt in—only two or three bargains in the "B" being marked; but some of it changed hands at top price. The "A" rose 2; and the "C" made the substantial advance of 5½. This improvement was largely the result of the issue of the accounts for the past half year. Taking into consideration all the adverse circumstances which have affected the gas industry during that period, the accounts must be regarded as highly satisfactory. Commercials were quiet, but firm; the debenture stock especially being done at top price, and nothing lower. The Suburban and Provincial Companies were almost neglected; British alone attracting attention and business at good figures. The Bromley Consumers' Company show by their accounts a good increase in business—earning their old rate of dividend within a trifle. The Continental undertakings were generally not buoyant; and Imperial fell 1½. The Indian and South American divisions made no sign. Melbourne bonds fell 1, in sympathy with the financial cloud resting over the colony. The Water Companies generally were weaker; and several quotations fell. New River, however, improved 1; the dividend coming out about a penny per share higher.

The daily operations were: Gas opened firm on Monday; and prices were good throughout the day. Gaslight 4 per cent. debentures rose 1½; and South Metropolitan "C," 2½. But Imperial Continental fell 1½. Tuesday was extremely quiet, but firm; Gaslight "A" advancing 2. The tendency continued favourable on Wednesday. South Metropolitan "A" rose 2; and ditto "C," 3; but Melbourne receded 1. Water was flat—Lambeth and West Middlesex going back 2½ each; and Grand Junction and Southwark, 1½ each. Thursday presented no special feature. Friday's business was mostly in Imperial Continental; prices being only moderate. For *ex div.* changes, see list on p. 307. On Saturday there was a little more activity in Gaslight issues; but all quotations remained unchanged.

ELECTRIC LIGHTING MEMORANDA.

Mr. W. H. Preece advertizes the Electrical Exhibition—Prof. G. Forbes's Cantor Lectures—The Lesson of Tesla's Experiments.

PASSING reference is made elsewhere to a communication on "Electricity at the Crystal Palace," to which Mr. W. H. Preece, the versatile Electrician to the Post Office, treated the readers of last Wednesday's *Daily Graphic*. The main purpose of the letter was probably to arouse a little more popular interest in the Electrical Exhibition, which would be all the better for more attention on the part of the shilling-paying public. Mr. Preece admits that "there is nothing really new to the electrical engineer" at this show; but he claims that it "brings home the practical and domestic applications of science to the masses." He says a good word for the "illustrative completeness" of the rooms fitted up to show the household uses of electric lamps; and probably he remembered with regret, while writing these lines, the more booming times when he travelled about the country showing a doll's house electrically lighted. Alas! it takes a bigger bait to get a rise out of the investing public now than it did in those days. Mr. Preece is uneasily conscious that the lighting at the Palace is overdone; and he puts into the mouth of an imaginary "poor gasman"—whose dividends, by the way, the electricians would dearly like to emulate—a plea against desertion, on the score that, although "dirty and dangerous, he is cheap." Mr. Preece remarks that "this poor gasman has not yet realized the fact that the electric light can be cheaper than gas." No; nor has anybody else that we know of. It was only the week before last that the *Electrical Review* almost went out of its way to insist that the price of electricity in pence per Board of Trade unit is equivalent to that of gas in shillings per 1000 cubic feet, and to protest warmly against the bad faith of those electricians who should attract custom upon any lower statement of the matter. But Mr. Preece is superior to criticism,

like the Brush Company and their French measurement. It might be an interesting investigation, albeit a difficult one, to ascertain in how many instances the possible adoption of electric lighting has been hindered by the notorious untrustworthiness of its most conspicuous partizans. As though a single misrepresentation was not enough, moreover, Mr. Preece jeers in the same letter at the idea that high-pressure electricity can be dangerous. But can he have already forgotten that Brighton case?

Professor George Forbes has been selected by the Council of the Society of Arts to deliver a series of Cantor Lectures on the "Developments of Electrical Distribution." Quaint and curious as are some of Professor Forbes's ideas on the subject of electric lighting—he is one of the few men who have ever professed to see beauty in overhead wires—most of his observations respecting matters electrical are generally worth reading. In his opening lecture, he plainly told his audience that, when he treated of the same subject before the Society in 1885, the low-tension system was the only one available, and when they came to look into the cost of laying mains, "it seemed as if they were to sink copper mines in the streets in order to solve the problem;" and he went on to emphasize the fact that, "since the period mentioned, not one single invention of importance had been added to facilitate low-tension distribution." It is worthy of mention, as bearing upon this statement, that the Chairman of the St. James's Company told the shareholders at the last general meeting that the two generating stations of this undertaking were to be connected with a trunk main having a sectional area of 8 square inches of solid copper. This looks bad for those municipalities and others who have adopted the low-pressure system for covering large areas. Professor Forbes also made some pertinent remarks upon the comparative working of central stations and isolated plants; showing how it happens that the former are more costly than the latter, owing to the heavy outlay for mains and the smallness of the daylight consumption. Then, in order to provide for growth of business, the engines of a central station must be larger than is necessitated by the actual work to be done, which means wasting a great deal of steam by working the engines under their full economical load. *Engineering* had an interesting and instructive article upon this head in a recent issue; illustrating the point that the very class of engines which are most economical of steam at full load, are most wasteful when running light, which is the normal condition of machinery in an electric supply station. The net result of these considerations, said Professor Forbes, is that "electricity in London costs twice as much as gas." He warned his hearers not to be led away by the too optimistic statements of those who were interested in trying to make out that electricity is cheaper than it really is. (See Preece *passim*.) Professor Forbes gallantly declared that the electrical industry has nothing to fear from competition; but that "the best way to gain the confidence of the public, and make progress, is to openly state the cost, and apply all skill to overcome the difficulties." This is manly and candid; and if all electricians would follow the Professor's example in this regard, we should be able to discuss technical matters with them much more freely than is now the case, when nearly every statement emanating from their side has to be appraised like the sworn testimony of a professional expert in a patent case.

It was only to be expected that the striking experiments of Mr. Tesla with electricity of exaggerated voltage and frequency of alternation, would vastly impress the town. Nobody who has not seen Mr. Tesla's performance, we are assured, can realize the beauty of his effects, or appreciate the degree in which they appear to upset all preconceived notions of the nature of electrical "currents." One critic declares it to be his belief that Mr. Tesla has succeeded in converting dynamic into static electricity; but, as nobody knows what either form is, the explanation does not greatly advance matters. It is only natural also that the lighting phenomena produced by Mr. Tesla should inspire some people with the idea that not only gas and oil, but all the existing electric lighting systems, are shortly to be superseded by some means of exciting light-radiations without spending energy upon the simultaneous creation of dark heat-rays. It is true that at present, if we compare light and heat radiations to the higher and lower notes of an organ, we know no other way of obtaining the former than by previously exciting the latter; so that it is as if, in order to sound an upper C, we have also to open every lower pipe and blow "like mad." Yet there is another way of looking at the same problem, which is to say that whoever would radiate light without heat, is like a man who wants to travel at a high rate of speed without including slower rates of progression. He wants, that is, to travel over a given route at a rate of 100 miles an hour; whereas he has no means of doing so at a rate of four miles an hour. Which illustration is the truer?

Dr. Ballard, F.R.S., has resigned his position as one of the Medical Inspectors of the Local Government Board; and Dr. W. Fletcher, the Medical Officer of Health for the Ormskirk District, has been appointed to fill the vacancy.

Illuminating Flames.—Professor Vivian B. Lewes, F.I.C., F.C.S., of the Royal Naval College, Greenwich, will deal with this subject in a lecture to be delivered at the London Institution, Finsbury Circus, next Thursday evening at six o'clock.

THE CRYSTAL PALACE ELECTRICAL EXHIBITION.

SECOND NOTICE.

THE Electrical Exhibition at the Crystal Palace is now, to all intents and purposes, complete; and intending visitors to London who may be proposing to include an inspection of this show among their Metropolitan engagements, need not therefore postpone their journey. Whatever lessons the exhibition may have to offer are to be appreciated now or never; and it will be as well to take stock of the various stall-holders' displays before the novelty of the thing has worn off. We are supported in this view of the completeness of the exhibition by the circumstances that the Lord Mayor of London, who was made President of the "Honorary Council of Advice" (presumably in the interests of the City of London Electric Lighting Company), was taken to see it last Saturday week; and that Mr. W. H. Preece was permitted to puff the show in his usual airy style in last Wednesday's *Daily Graphic*. The exhibition being therefore finished, ready for inspection and criticism not more than a month after the formal opening, it is necessary to state here what it amounts to, as a piece of marshalled evidence of the condition of the electrical industries.

We have already explained (*ante*, p. 105) what the exhibition is designed to be; and we now propose to describe it generally. For the sake of clearness, we shall take the exhibits as broadly divisible into three orders: Lighting, Power Machinery, and Electrical Apparatus. If any additions to, or interesting modifications of, the exhibits are made during the progress of the show, it may be necessary to return upon our tracks, and go over part of the same ground again. For the time being, however, we shall endeavour to adhere as closely as practicable to these divisions. Lighting takes the first place, of course; for it is the net result of the arrangements made in such of the other classes of exhibits as our readers are most interested in. The lighting is admittedly the *raison d'etre* of the exhibition. The lamps and their ancillary plant are, it is true, eked out by exhibits connected with telegraphy, telephony, and other applications of electricity; but the latter would never have been shown at Sydenham if it had not been for the supposed desirability of exhibiting the former. This is, in short, an exhibition of electric lighting and lighting plant, or it is nothing. The credit of the enterprise must stand or fall upon the lamps. This being so, what is the lighting like? Well, in the first place, it must be admitted that there is plenty of it. From the mast-headed clusters of arc lamps of Siemens Bros. and Co., Limited, and the Brush Company, down to the modest little glow-worm sparks to be found in humble stalls devoted to the advertisement of primary batteries, there must be collected in the Palace some thousands of arc and incandescent lamps of every sort and size known to commerce. There is so much light, indeed, that there is no sensation of glare. The spectator's eye is tuned up to bear such a high standard of illumination, that it is enabled to contemplate arc lamps without distress; and the observer consequently receives a good impression of electric lighting. This is probably what the promoters and the organizers of the exhibition aimed at; and we are prepared for arguments from them tending to make capital out of this effect. But let us stay for an instant, and wonder what the aggregate candle power of all these lamps may be. They are so numerous that it is futile to attempt to count them. The Brush Company claim, of course, that their cluster of six mast-head lights, which pass almost unnoticed in the dome about half-way down the South Nave, are of 2000-candle power each. The Siemens lights are not even shaded by opal glass; but one would be puzzled to find a spot on the floor where they throw a shadow. There are no shadows in this nave, for what with tower lights, arc lamps hung at various heights, and stalls blazing with incandescent lamps, it is a striking illustration of the capacity for adaptation of the human eye that the spectators can see at all. The infinite number of incandescent lamps at low levels, moreover, serve another useful purpose, besides that of mere lighting—they correct the pallid light of the arc lamps, and prevent the spectators from exhibiting to one another that corpse-like appearance which the arcs alone would inevitably have produced. After seeing the South Nave of the Crystal Palace as now lighted, it will be understood that, if electric lighting could always be done upon this scale, it would certainly be effective. Even an occasional extinction here and there would pass unnoticed; and this is a most important consideration.

For, be it understood, this exhibition of lighting differs more in quantity than in quality from that of ten years ago. There are perhaps a thousand lamps on view now to one shown then; but when the lamps are examined individually, they do not appear better or worse than their predecessors of 1882. And this is the chief consideration for an intending user of electric light. It is all very well for the members of a town council deputation, or the resident in a district blessed with a central station electric light company, to go the Crystal Palace and be dazzled with a collective display in which one lamp helps another, and the general effect is produced at a cost of goodness only knows how much per square foot of floor area lighted. And not only will their eyes be impressed by this splendid effect, but their minds also will be turned away from the real meaning of it all if they listen to gentlemen like Mr. W. H. Preece. The point is, what will these lamps

look like, and what will they do, when they are taken home and posted far apart in dingy streets, or when a householder tries to read and work by the one or two incandescent lamps that he can afford? Well, we do not say that arc-lamp carbons are not better made than they used to be—we are not concerned now with the question of expense, except in so far as it entails the necessity of depending upon every lamp to do its proper work—and doubtless the conditions of steady lighting are better understood and more fully satisfied that they were in 1882. But, after all said and done, the fact remains that the arc lamps at the Palace do occasionally sputter and go out; and the incandescent lamps do in many instances vary and throb, just as did the early ones of their kind. It is a positive fact that wherever a good lighting effect is produced at the Palace, either in the naves (which is tantamount to outdoor lighting) or in the specimen furnished rooms—and we are far from denying that such effects are produced—it will be found that the scale of lighting is greatly in excess of the ordinary domestic standards. We do not urge this observation as a reproach to the exhibitors whose proceedings have suggested it. They must obtain their effect, without heeding the quantitative question. But it is a commonplace to say that "science is measurement;" and this is precisely the point to be remembered by visitors to this brilliant show.

The next question which we had in mind in going through the lighting part of the exhibition, was as to whether any new practice in the application of light-sources to the purposes of interior or outdoor illumination has come out of this new resource of the modern school of illuminators of our streets and dwellings. We all know what the electric arc can do; and the lightness and handiness of the incandescent bulb, with its freedom from flame, would seem to offer a wide range of novel application to the ingenious technician. Our investigation resulted in disappointment. There is a terrible want of originality, and a deplorable absence of taste, observable in most of the exhibits of lighting and lamp-fittings. Electrical science has its Edison, its Swan, and its Brush; but the brilliant stroke of genius that gave the world "French measurement" in electric lighting, exhausted the invention of electricians in this field. The curse of the commonplace lies heavy on the makers of electric light fittings; and it is an object-lesson in the character of the culture of the age to compare the beauty of fitness, as displayed in a modern steam-engine, with the poverty, emptiness, and downright vulgarity of the great bulk of electric light fittings. It is hardly credible, but it is nevertheless too true, that, in the utter debasement of their "art," the fittings makers have taken infinite pains to make imitations of wax-candles—flames and all—out of incandescent lamps! These wretched impositions are to be seen at the Palace by hundreds; and they inspire the thoughtful observer with inexpressible disgust. When the poor ignorant gas-fitters of the early Victorian period put up their glassy imitation candles, surmounted with batswing flames, they knew no better; and the artist in decoration was not then evolved. These fittings would now be regarded as curiosities, wherever found; and we take a little credit to ourselves for having pointed out the absurdity of such imitations many years ago. What might have been pardonable in the uninstructed gas-fitters of the middle of the century, moreover, is abominable in their "advanced" rivals of to-day. These sinners against artistic veracity and consistency are, however, shameless in their turpitude. Take one of the most "bumptious" of them all—the firm of Rashleigh Phipps and Dawson, who have spread themselves very much over the official catalogue. This firm tell purchasers of this publication that their "showcase is after the model of a Mosque at Cairo, and has been specially designed and manufactured by the firm. The Lily is introduced in the screen work, after the manner of the Ancient Assyrians, who held it as an object of veneration. The Dome is covered in with Glass and Amber Cloth, and is in the form of the Breast—a suggestion that Peace nourishes the Arts and Sciences." There is much more of the same style, intended to impress readers with a deep sense of the high-toned work shown in this wonderful stall. Yet here also we find imitation candles "after the manner of the ancient"—gas-fitters! But this firm are not alone. It is the same with Messrs. Benham and Froud, Messrs. Allen and Mannooch, and many others. Sometimes the sham candle-flame is a cylindrical bulb of clear glass with elongated incandescent fibre; sometimes it is in the form of a spiral, frosted or plain, with irregular section, to still more closely copy a flickering candle flame. But, in one or another of these shapes, the scientific decorators of the Palace Exhibition propose this patent lie as the proper thing for their patrons to keep under their eyes daily and nightly! Imagine sitting at a dinner-table so lighted, as may be seen in Messrs. Allen and Mannooch's room in the South Gallery! One would expect to be served with logwood-port, fuchsine-claret, and cider-champagne at such a table; and who could confidently partake of jugged hare, *vol-au-vent*, or other mysterious dish under such a prevaricating light? One firm of exhibitors—Messrs. Frank Giles and Co.—actually go so far as to place imitation wax candles of huge proportions, such as are never seen outside Catholic churches, in one of their specimen-rooms, and top these off with ordinary incandescent bulbs. It is difficult to tell the tale patiently. The example just named is perhaps the worst in the list; but an imitation candle, whether large or small, is an outrage hard to be borne. The sight of it is enough to make anybody rush home and light up the real article, with the feeling of relief that here, at least, there is no deception.

We hope to return next week to the Lighting at the Crystal Palace Exhibition; but we shall leave it for the present with this grave complaint against the fittings' manufacturers and decorators. In order that the subject of these so-called "flame lamps"—this is, we are informed, their trade name—may be understood, it may be stated that they are a product of the last year or two. They can, of course, be employed quite unobjectionably as "fairy lamps" for decorative purposes. They take 33 volts, and are connected in series of three, when the group becomes equivalent to one 100-volt lamp. It requires, however, more taste in lighting than most decorators seem able to command, to employ these or any other description of incandescent lamps in such a manner as to be truly ornamental as well as useful.

Southern District Association of Gas Engineers and Managers.—The annual meeting of this Association, which, in the ordinary course, would have been held last Thursday, has been postponed until Wednesday, the 9th prox., when the President (Mr. Andrew Dougall, of Tunbridge Wells) will deliver his Inaugural Address, and the annual dinner will take place. The reason which prompted the Committee to make this change in the arrangements, of which members have been apprised by circular by the Honorary Secretary (Mr. J. W. Helps, of Croydon), was the large amount of sickness prevalent at the time.

The "Electrical Trades' Directory and Handbook for 1892," a copy of which we have received from *The Electrician* Printing and Publishing Company, Limited, has reached its tenth year; and the present edition may be confidently said to fully sustain the reputation of its predecessors. The Directory consists of three main divisions—the Handbook, the Directorial, and the Biographical; and in each the information given is brought well up to date. The issue under notice is larger, by nearly 100 pages, than that for the past year; while the general contents have been improved by the omission of matter bearing only slightly upon the electrical industry. As a work of reference, the book will be useful beyond the sphere indicated by its title.

The Petroleum Production of the United States in the Past Year.—The production of petroleum in the United States last year was the largest in the history of the country. In 1889 it was 35,163,513 barrels, of which Pennsylvania and New York produced 21,487,435 barrels; Ohio, 12,471,466 barrels; West Virginia, 544,113 barrels; Colorado, 316,476 barrels; and California, 303,220 barrels. The remainder was produced in Indiana, Kentucky, Kansas, Texas, and Missouri. No detailed figures have been published for 1890; but the production was somewhere about 46,000,000 barrels, of which 29,000,000 were produced in New York, Pennsylvania, and northern West Virginia, a little more than 1,000,000 in the Macksburg district, upwards of 15,000,000 in Lima, and 1,000,000 in other districts—making a total of 46,000,000. The production in 1891 was approximately 50,150,000 barrels, of which Pennsylvania, New York, and West Virginia produced about 34,500,000 barrels; Macksburg, less than 400,000 barrels; Lima, about 14,500,000 barrels California, 350,000 barrels; Colorado, 325,000 barrels; and the rest of the country, 50,000 barrels.

Is Electricity a Manufactured Product?—One important question brought out by the rapid development of electricity is now causing, says the *American Manufacturer*, no little trouble in the Courts throughout America. This question comes in the way of the authorities empowered to levy taxes; and they are called upon to decide as to whether or not electricity is a manufactured article. In the State of Pennsylvania there is a law of some years' standing which exempts from taxation the capital stock of manufacturing companies. The existence of this law brought an early test of the question as to whether electrical companies could be classed as manufacturers. Judge Simonton, of Dauphin County (Pa.), in a decision which was subsequently affirmed by the Supreme Court, held that a company producing electricity was not a manufacturing company within the meaning of the law. He ruled that, whatever electricity may be, it is manifestly and admittedly not a material substance; and whatever electric light companies do, they do not, in generating or evolving electricity, make changes or modifications, by art or industry, in the form or substance of material articles. They do not make wares of any kind, nor reduce raw materials to a form fit for use. Judge Williams, in a decision on the same question, declared that nothing has been said to lead to the belief that electricity is a material substance, therefore its production or generation or evolution does not come within the authoritative lexicographic, scientific, or local definition of the terms "manufacture" or "manufacturing." Those connected with electrical interests claim that electric light or power stations should in law stand on the same footing with gas-works. It is claimed that the production of something by the consumption of coal, whether it be gas or electricity, must be classed as manufacturing. So far, however, all decisions have been against the electrical companies; and taxes must be paid upon the capital of these companies until they can show that electricity is a manufactured article, unless in the meantime new laws are made to meet the development of a new force.

COMMUNICATED ARTICLE.

LIGHTING.

By W. H. Y. Webber.

PART III.—A CRITICAL EXAMINATION OF MODERN PRACTICE.

(*Continued from p.* 198.)

THE LIGHTING OF INTERIORS.

In the illumination of interiors, we are brought face to face with an altogether different set of conditions to those which govern street lighting. In the first place, the idea of beacon lights is quite foreign to interior lighting, and can hardly even be said to enter into the problem of illuminating those open-air spaces, such as works, yards, &c., which practically resemble interiors in their requirements in the matter of light. So marked, indeed, is the difference in this particular between street and indoor lighting, that whereas in the former the visibility of the lamps themselves is an important element of their usefulness, in the latter it is rarely desirable that the means of lighting should be obtruded upon the notice of the spectator.

Another prime consideration in regard to interior lighting is that it is always required to be carried out upon a higher scale of brilliancy than is necessary or desirable for streets. The permissible minimum of illumination must therefore be raised in proportion; and this again means that, if low power sources are employed, there ought to be many of them, or they should be brought very close to their work, or we must use sources of comparatively high power. The choice between these methods of obtaining the bright lighting required is affected by various considerations. Thus, if we desire to light a public hall, a railway station, or a church (taking account only of the light required on the floor area), the end may be attained by suspending a number of equally-spaced small lights close under the ceiling, or at any lower level where they will allow sufficient head-room; or similar lights may be clustered at equally-spaced centres; or, again, a number of concentrated high-power lamps may be adopted.

At first sight it might be thought that the first plan would prove suitable; but experience shows that it is not so in practice. At the South Kensington Inventions Exhibition of 1886, some of the main buildings were lighted in this way, by means of a great number of incandescent electric lamps sown very thickly over the under side of the roof. The effect was not at all pleasing, although the illumination of the floor was very brilliant, and absolutely uniform and shadowless. The multiplicity of bright points high overhead was dazzling, and their regularity was bewildering to the eye. It was an aggravation of the well-known irritation produced by geometrically-spotted wall papers, which suggest distracting attempts at counting and spelling along the too-pronounced lines of figures of the pattern. Lines of small lights marking in the colour of fire the main architectural features of a majestic interior, are not open to this objection, nor are large circular hoops of flames, which, when of sufficiently large diameter, assume, so to speak, the character of architectural features in themselves. Good examples of the former style of lighting are, or were, to be seen at the Crystal Palace, and in the dome lights of St. Paul's Cathedral, London. The effectiveness of the latter style in a thoroughly commonplace interior is well shown at the Agricultural Hall, Islington. It is one of the very best ways of lighting a temporary, bare hall or shed of large area for a special occasion; and it has the additional recommendation of requiring only the cheapest and most universally available materials.

The plan of lighting a hall with clustered lights may be carried out by means of so-called sun-burners in the ceiling; by one or more large pendants of the "chandelier" type; or by smaller pendant clusters suspended in mid-air. The first displays the decorations of the ceiling, where there are any, and can be made to help the ventilation; the second is decorative in itself; the third is also decorative, but in a lesser degree, and is effective under certain conditions, one of which is that the interior is not too wide. When this is the case, so that three or more longitudinal lines of clusters are required to properly light the central parts of the hall, the irritating "pattern" effect is apt to occur, and the plane of the clusters obtrudes itself on the eye as a division of the height of the hall which is objectionable. Sometimes a combination of two of these plans, with the addition of wall lights at a low level, is found effective.

The remaining plan of lighting large interiors, with a number of high-power lamps, demands care in execution, because, if the arrangement should be unfortunate, the very brilliancy of the elements in the design aggravates the mischief. At the Reading Town Hall, a bold experiment was tried of placing the light-centres out of sight, behind a depolished glass false ceiling. The House of Commons was lit in the same way. The effect is highly pleasing, and the arrangement is helpful to the ventilation. When high-power lamps are not used in this way, they are best as substitutes of the more extravagant sun-lights.

It may be remarked here that in these articles the question of ventilation, so important in connection with the artificial lighting of interiors, whether large or small, is not intended to be dealt with except incidentally.

Having all these arrangements of possible lights for a public hall, church, or factory to choose from, we may return to the one datum to which all must be referred—that of the amount of light required on the floor-area. Mr. Richards has stated as his view of the matter* that the average illumination of the floor-area in such cases should be the equivalent of the light afforded by one standard candle at the distance of 4 feet. This datum is as good as another to show the working of the rules already given.

The provision of this minimum effect at the floor-level is to be arranged for by means of lights whose collective power must be determined in the first place by their distance. Let the case of a hall 80 feet long, 30 feet wide, and 25 feet high, be considered by way of example. The floor-area in this case is $80 \times 30 = 2400$ square feet. According to the conditions proposed, there must be, at the height of 4 feet above the plane of the floor, an imaginary plane of light of the intensity of one candle. Supposing the lamps to be used for the purpose are recuperative ventilating gas-lamps, with their flames in a horizontal plane 1 foot below the ceiling, it follows that the luminous intensity at this distance, 24 feet above the floor, must be in accordance with the ratio $Q = I \times \left(\frac{d_1}{d}\right)^2$. In this case, $I = 1$ candle; $d_1 = 24$ feet; $d = 4$ feet. Whence, $I = 24 \div 4 = 6$. Wherefore, $Q = 1 \times 6^2 = 36$. That is to say, at six times the distance of the datum intensity from the floor, there must be 36 times this intensity in the means of lighting employed.

The next step is to determine the quantity of light required. One candle at a height of 4 feet above a horizontal plane will effectually light an area of such plane, having the radius $= h \times \sqrt{2}$. Here $h = 4$; wherefore the formula reads $4 \times 1{\cdot}414 = 5{\cdot}656$; and the area of a circle drawn from this radius is 100·29 feet, nearly. Consequently, the nominal number of candle-units required for lighting the floor of the hall will be $2400 \div 100{\cdot}29 = 24$ nearly. The lamps used must therefore be of $24 \times 36 = 864$-candle power in the aggregate, which would be supplied by eight lamps of the kind named, each developing 108-candle power, and consequently burning about 12 cubic feet of common gas, according to the average efficiency of this type of lamp. If clustered gas-burners are preferred, the necessary correction is easily made. If, instead of a whitened ceiling, the hall has an open wooden roof, the nominal power of the lamps must be increased to compensate for the absence of reflection.

It will be perceived that there are two ways of rating. This method of expressing the facts also lends itself to the direct measurement of lighting by the aid of a standard candle, as will be described later.

When the most unscientific person is told that, for comfort in reading, he needs light equivalent to that of a standard candle the flame of which is at a distance of 6 inches from the printed page, he understands what is meant, and can be convinced that such an effect is only to be obtained by proper means. It may be remarked that the Law of the Cosinus does not enter into explanations of this nature, because it is experimentally proved, albeit unconsciously, by the tendency of readers to hold their books at such an angle that the rays of light fall upon the page as nearly vertically as can be conveniently managed.

All the problems of domestic lighting that arise in common practice can be dealt with by an intelligent application of the rules already given; the data of lighting intensity being settled, of course, with reference to the requirements of every case. The table given in Vol. LVIII., p. 754, may be safely followed in the ordinary way; due regard being had to the necessities of distribution. Take, for example, the case of a dining-table, which requires lighting according to the 1-foot standard—that is to say, up to the lighting effect of 1 candle at 1 foot distance. A recuperative lamp at a height of 7 feet above the table must have an illuminating power of $\frac{7^2}{1^2} = 49$ candles to produce this effect; and such a lamp will be effective over a circle with a diameter of $2\ (7 \times 1{\cdot}414) = 19$ feet, before which, however, the shadows would become objectionable if there were no end or side lights. These are matters which cannot be dealt with by any hard-and-fast rule, for interior lighting must always be more or less decorative.

With regard to the lighting of dining-tables, for instance, there is much difference of taste. The only point upon which connoisseurs are agreed is that the light upon the table itself should be brilliant. Beyond this there is chaos; for whereas some prefer a central overhead lamp of high power, to be out of everybody's way, others give the preference to candelabra, which need to stand upon lofty pedestals if there is to be uninterrupted view from end to end of the table. There should be as few sharp shadows as possible on the table-cloth; and therefore, when a table lit from a central point overhead is so long as to approach the effective limit already laid down, some means of neutralizing the shadows would be called for.

Drawing-rooms can be satisfactorily lit from the side walls when the width of the room is not too great to permit of the radii of effective lighting from each side meeting in the middle of the floor. Since, in order to provide head-room, the side lights must be at least 6 ft. 6 in. from the floor, this means that such a means of lighting would fail for rooms of greater width than $2\ (6{\cdot}5 \times 1{\cdot}42) = 18$ ft. 6 in. nearly. In this case central pendants must be provided for occasions when the apartment is fully occupied.

* See JOURNAL, Vol. LVIII., p. 753.

An effect of lighting which might in some circumstances be called "spotty" is seldom an objection, if properly managed, in a drawing-room. Cozy nooks and corners left in *chiar'oscuro* are much more to the modern taste, for rooms principally devoted to conversation, than one uniform glare of light, such, for example as that imperatively called for in a ball-room. Where a drawing-room may be used for both purposes, the arrangements for lighting should be adapted accordingly, so that no makeshift lights may be needed to bring up the standard of brilliancy. On the other hand, when the room is required merely for conversation, the extra lights that are not needed cost nothing.

It should be borne in mind that a good deal of reading and fancy needlework is done in drawing-rooms; so that the wall lamps must be powerful enough to throw a good light upon a low chair at a comfortable distance, especially beside the fireplace. Units of 20-candle rather than 16-candle power should, therefore, be chosen for such points; but certainly not less than the latter, as, in all probability, semi-obscure globes and shades will be employed in conjunction with them. The now general use of ornamental standard oil-lamps, for placing about drawing-rooms as occasion requires, testifies to the popular taste for localized lighting in apartments of this order. There could not be a greater error than to confound the general liking for "soft light" with toleration of dimness or bad lighting. Some electricians have lately maintained that, so long as there is nothing brighter in a house to throw them into the shade, 8-candle lamps will give as much satisfaction as lamps of 16 or 20 candle power. Those who make this assertion, however, can hardly realize the requirements of reading or fine work, which cannot be met with ease, except by using a contiguous table or other stand for the lamp, by any light-source possessing much less than 16-candle power.

In the lighting of studies, libraries, &c., which are used both by day and night, it is important that the artificial illuminant should come from the same direction, and at as nearly as possible the same angle, upon reading-desk or writing table, as the window light. Apartments of this kind require a fairly good general light as well as the powerful light upon the desk. For the former, one recuperative burner or more, according to the size of the apartment, will be the best form of ceiling light; and nothing beats a good Argand for the table. It is undesirable to burn more gas than is absolutely necessary in rooms of this description. Generally speaking, no light of combustion should be closer to the head of the person using it than a distance of 4 feet, and the light should come from the left hand and above.

Wall lights are customary for bed-rooms, and, whenever possible, these should be so placed as to command the bed, with a view to the requirements of sickness. For good bed-rooms, and also for dressing-rooms, a small hanging recuperative lamp should be provided, in a position to command the dressing-table. (A small gas boiling-stove in a suitable and safe position is a useful addition to the lighting arrangements of a bed-room, dressing-room, and night nursery.)

It is hardly necessary to add any remarks concerning the lighting of halls, corridors, staircases, or offices. For the kitchen, however, the necessity of a good light commanding the cooking-range is not always so well remembered as common sense would appear to suggest. Observations respecting the safe disposition of lights, the necessity of good regulating of pressure, &c., do not fall within the scope of these articles.

Warehouse, shop, and office lighting presents so many and so various requirements that it is impossible to treat of them in a general memoir on the subject. Suffice it to remark that the best results will be obtained when practical knowledge of these classes of lighting work is guided by the principles already laid down. Stinting of light is the worst parsimony in shop-keeping; but the choice between powerful light-centres and a multiplicity of small, but brilliant, points of light, must be guided by circumstances. It is, however, possible to state generally that when there is good reflection from bright metal or glass, white walls and ceilings, and the interiors are lofty, the former order of lamps are capable of rendering good service; whereas in much-divided interiors, or shops filled with dull cloth goods, &c., small brilliant lights, of the albo-carbon or like character, are preferable. Reference may here be made to the views expressed by MM. de Montserrat and Brisac upon the general subject, as given in the JOURNAL Vol. LVIII., p. 845.

(To be continued.)

Royal Masonic Institution for Boys.—An appeal is made to subscribers to this Institution to reserve their votes for the next election on behalf of Henry R. Harris, eldest son of the late Bro. Frank Henry Harris, of Abingdon, who was, at the time of his death (Dec. 6, 1891), a member of the Evening Star Lodge, No. 1719, and also a subscriber to the Institution. Bro. Harris, who died after a long illness, left a widow and six children—the eldest being twelve years of age, and the youngest only three months old—very inadequately provided for. The case is strongly recommended by a number of brethren well known to our readers—W. Bro. James Glaisher, W. Bro. John Aird, M.P., W. Bro. Magnus Ohren, W. Bro. W. A. Valon, and many others. Bro. John Ely, of the Abingdon Gas-Works, will gladly receive proxies; or they may be sent to the JOURNAL office, and will be duly acknowledged.

TECHNICAL RECORD.

A PORTABLE PHOTOMETER FOR MEASURING STREET LIGHTS AND ILLUMINATION IN GENERAL.

A Paper read by Mr. Carl Hering before the Engineers' Club of Philadelphia.

Some time ago the writer was called upon, by a Committee of Councilmen from a town in Pennsylvania, to settle a dispute regarding the candle power of the electric street lights, for which the town had contracted with a local Electric Light Company. The Company had contracted to furnish a certain number of incandescent street-lamps of 25-candle power. But, after a year's trial, the town authorities thought the electric lights at 25 candles were not so bright as the gas-lights at 16 candles; and they concluded that they were not getting what they paid for. The matter was referred to the writer, to measure the actual candle power of the lamps throughout the town, and make a report thereon.

The Electric Light Company suggested that the lamps should be taken from the poles, brought to the electric light station, and measured there by means of the ordinary photometer. Although this simple method appeared satisfactory to the councilmen, it was not so to the writer, for obvious reasons which any electrical engineer would appreciate. It was concluded that the only satisfactory way was to measure them while on the poles, on different days, at various times in the evening, and without the knowledge of the Company as to the days or hours when the lights were to be measured. This required the construction of a portable photometer, which had to work equally well in all kinds of wind and weather. It had to be light and small, so as not to attract attention, in order that the Company should not know that the lights were being measured, and take unfair advantage of the opportunity to run up the power. It was also necessary that the results should be quite reliable, as the matter might have to go before the Courts.

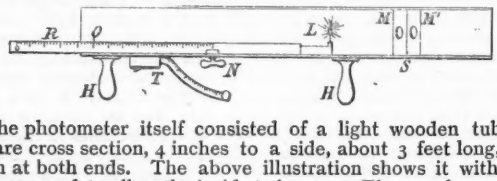
The conditions were, therefore, very hard to comply with. One of the chief difficulties was to get a standard light that could be employed out of doors in a portable photometer. To use a standard candle was out of the question. Its light varies with the temperature, it often requires trimming, and it would be almost, if not quite, impossible to prevent the wind from affecting its candle power; for it is well known that even a person moving about in a photometer-room will make sufficient disturbance of the air to change the lighting power of a standard candle. Besides, such a candle, at its best, is a very poor standard. For this and other reasons, it was decided to try to use the Hefner-Alteneck amyl-acetate lamp. This lamp, as is well known, burns a liquid which is constant in its composition—that is to say, it does not contain varying quantities of more or less highly combustible materials, as benzenes and coal oils do. All the dimensions of the lamp may be doubled with great precision, thus enabling the whole standard to be duplicated with greater accuracy than a standard candle. If the flame is kept at a certain fixed height, by means of a gauge and a wick-screw, the light will remain constant. The original proportions were determined by its inventor by very exhaustive experiments, made under the most favourable conditions with the standard candle; so that this lamp may be taken as representing a fair mean of the average values of standard candles.

In constructing the instrument, it was at first attempted to use this standard lamp in the portable photometer itself. It was suspended on a pivot, so that it remained vertical when the photometer was inclined; the axis of the pivot passing through the centre of illumination of the flame. The lamp was enclosed by concentric cylindrical tubes, with openings at the top and bottom, so that the wind, from any side, would not affect the draught or the flame. Lights were so arranged that the height of the flame could be adjusted without opening the enclosing case. But, notwithstanding all the precautions taken, it was found that the flame burned differently when in the wind-protecting box; and this lamp was therefore discarded as unreliable when employed out of doors.

The next device tried was to take a portable outdoor lamp, such as is used by night watchmen, having a broad, flat flame, and place on one side of it a black screen, with a hole in it just opposite to the whitest portion of the flame. As this part of the flame may be taken as remaining constant for all slight changes in the height, size, or flickering of the flame, the light passing through this fixed aperture may be regarded as constant and steady. The oil used was amyl-acetate, the same as in the standard above mentioned. This was found to work well in a room, and when the photometer was held horizontally; but when used out of doors, or when tilted slightly, it was discovered that the glass or mica shielding the flame from the draught became turbid or blackened; making a very great change in the amount of light transmitted through it. It was noticed also that the flame, like that of a standard candle, appeared to become smaller and less bright in the cold air; and therefore it also was abandoned.

There seemed to be nothing left but to use an electric light supplied by a portable accumulator. This was tried, and was found to be perfectly satisfactory. The lamp used was a small

four-volt incandescent lamp of about 1-candle power, requiring a current of slightly less than an ampère. The accumulators consisted of two cells, placed in a wooden box having a shoulder-strap, enabling it to be carried by the operator at his side. The weight of it complete was about 2 lbs. The cells were sealed with lids before the acid was added; and the whole was covered with a thick layer of powdered carbonate of soda, so that, if any acid came out through the vent-tubes, it would be decomposed and then evaporate. As the voltage of an accumulator will become less and less as it is being discharged, it would change the candle power of the light very materially. To overcome this, the accumulators were chosen of such a capacity that the amount of current used in one set of tests was only about 1-50th of its capacity. The fall in potential for so small a discharge may be regarded as negligible. Furthermore, as the light was turned on for only about half a minute at a time, with intervals of rest of five or ten minutes, the cells had time to recuperate. They were discharged slightly before the test, in order to bring them down to their normal and constant voltage. Comparisons of this light with a standard during different parts of the evening showed it to be quite reliable and constant.



The photometer itself consisted of a light wooden tube of square cross section, 4 inches to a side, about 3 feet long, and open at both ends. The above illustration shows it with one side removed, to allow the inside to be seen. The usual screen S, with a grease-spot and mirrors M, was placed near the right-hand end, and a square opening left in the side of the tube opposite to it to look through. The tube was blackened inside and outside with a paint made by mixing much lampblack with a little very diluted shellac. This paint, in drying, does not leave any gloss. It was supported by two projecting handles H—the right-hand one being nearly under the centre of gravity; so that the whole could readily be supported by the right hand alone. The small electric lamp L was secured to a block capable of being slid along the inside of the tube by means of a projecting rod R, having a scale attached (as shown), which indicated the distance of the lamp from the screen. This rod, with the lamp, could be securely clamped at any desired distance from the screen by a thumb-nut N. A 15-foot tape in a spring case T, without pawl and ratchet, was attached on the bottom near the left handle. A small switch (not shown) for turning the electric light on and off was also secured near the left handle.

To use the photometer, it must first be standardized. This is done in any convenient room which can be darkened. The instrument is laid on a table with the standard Hefner-Alteneck lamp, which is placed at a fixed and known distance opposite the right-hand end of the photometer-tube. The small electric light is then turned on, and moved forwards or backwards until the grease-spot seen in the mirror M^1 on the right-hand side of the screen, disappears altogether. The left-hand side (towards the small electric light) was not considered at all. This adjustment, therefore, admits of considerable precision, as there is no difficulty in making the grease-spot disappear on either one side or the other. The difficulty is in making it nearly disappear to the same extent on both sides; and it is here that the large personal error enters in ordinary photometric work, in which no two operators will set it alike. After making this adjustment, the electric lamp is firmly secured in that position, and the photometer is ready for use.

To utilize it in measuring street-lamps, or any other source of light, the right-hand end is pointed towards the light in a horizontal, a vertical, or an inclined direction. The small electric light is then turned on, and the whole tube moved towards or away from the light to be measured, until the spot of light again disappears on the mirror M^1 to the right of the screen. By measuring the distance between the screen and the light to be tested, and knowing the calibrated value, the candle power of the light is readily calculated from well-known laws. The distance from the screen to the large light is measured by means of the spring tape, which passes directly under the screen, and may be easily read by the operator. The small switch placed near the left-hand handle (not shown in the illustration) enables the current for the small lamp to be turned on and off readily, so as not to burn it longer than just enough for the test.

It will be noticed that in this photometer only the mirror on one side of the screen need be observed—not both, as is usual. The grease-spot may therefore be made to disappear entirely, which admits of an adjustment more accurate and decided than the usual method. It is for this reason that the photometer is even more accurate than the usual one, in which the balance is produced on both sides of the screen. The candle power of the small light, as well as its distance from the screen, need not be known or measured; they must merely remain invariable. This light simply serves as a constant secondary standard of light, which will at all times reproduce the same illumination of the screen as that produced and balanced by the real standard during the calibration; in other words, it forms an adjustable and portable unit of illumination of the screen as distinguished from a unit of light.

This form of photometer has the further advantage that it can be used to measure "illumination," as distinguished from the candle power of a light. For instance, the illumination on a desk, for reading or writing, the diffused illumination in a room, the light from a north window, or from a chandelier, daylight in general, moonlight on the streets, sunlight, &c., cannot be expressed in candle power. They must be measured in units of illumination; the unit being the illumination produced on a surface placed at a distance of a foot from a standard candle. In measuring such illuminations, the distance from the photometer screen to the source—as, for instance, in the case of daylight—is, from its nature, an immeasurable quantity.

To use this photometer for such measurements, the right-hand end of the tube is made in such a way that it can be taken off, so that the grease-spot screen forms the end of the tube. The photometer is calibrated, as before; but instead of securing the rod containing the little lamp, its position should be read on the scale shown in the figure—the zero of this scale being such that the reading gives the distance of the small light from the screen. Being thus calibrated, it is ready for use. To operate with it—for instance, to measure the illumination produced on a desk by daylight—the photometer is placed vertically so that the screen is on a level with the desk, and the electric light is moved until the grease-spot disappears. From the reading of this position, and that of the calibration, the illumination in foot-candles is readily calculated. From this, the number and position of electric or gas lights necessary to reproduce such an illumination may be readily calculated. For measuring daylight, the auxiliary electric light used must be very much brighter than before—at least 16 candles, and preferably more. As the electric light is very yellow compared with daylight, it is not easy to make the grease-spot disappear entirely; but this is not a serious objection, as great accuracy is not necessary in such measurements.

It is evident that this unit of illumination should be so chosen as to suit the light to be tested; otherwise the tape required to measure the distance might have to be impracticably long. This should be taken into consideration in choosing the distance to the standard lamp in calibrating the photometer. For measuring very bright lights, the standard should evidently be brought near to the screen, so as to make the unit of illumination greater. In the measurements above mentioned, the lights to be tested were from 10 to 25 candle power; and it was thought that from 4 to 6 feet of tape was a convenient distance—being an average of $1\frac{1}{2}$ inches per candle. This would require, as a unit of illumination of the screen, a little less than one foot-candle. For convenience in making calculations, the standard was placed at $14\frac{1}{8}$ inches ($=\sqrt{200}$) from the screen in the calibration. This gave such a unit that the square of the distances in tens of inches is double the candle power of the light to be measured—a calculation which is readily made mentally, at least approximately. A difference of 1-candle power in the unknown light would require a movement of the photometer of about $1\frac{1}{4}$ inches; a fraction of a candle may therefore readily be detected. Hence the photometer was quite sensitive enough for this class of work. The end of the tape was held up to the centre of the lamp by an assistant with the aid of a pole. The spring case kept the tape stretched, so that it was virtually a fixed rule or scale over which the whole photometer was moved. The right-hand end of the tube must be long enough to shield the screen from the light of other illuminants, or that of the moon.

Death of Mr. John Wright.—We regret to record the death, on Monday last week, in his 73rd year, of Mr. John Wright, founder of the business now carried on under the style of John Wright and Co., Limited, in Birmingham The deceased went to the Midland capital from Chipping Ongar, in Essex; and he gave the name of this county to the gas-stove works he established. Mr. Wright died at his residence, Marden Ash, Edgbaston.

Honours for French Gas Engineers.—We are pleased to find, among the recent nominations as Knights of the Legion of Honour, the names of M. Emile L. F. Cornuault, M. Démétrius Monnier, M. Firminhac, and M. Eugène L. Breittmayer. M. Cornuault, who is personally known to some of our readers, has rendered exceptional service to the City of Paris. It will be remembered that he prepared the report of the proceedings of the last Scientific Commission appointed by the Minister of the Interior to conduct the quinquennial investigation into gas manufacturing operations, with a view to the revision of the Paris Gas Company's treaty with the Municipality; and he also, as a member of the jury, reported on the lighting appliances of the International Exhibition of 1889. Both of these reports have been dealt with in our columns—the latter only a few weeks ago. He is Superintendent of the Marseilles Gas Company; and a Past-President of the Société Technique du Gaz en France. Of the other *décorés*, M. Monnier is a professor at the Central School of Arts and Manufactures, and a member of the Committee of the Société Technique; M. Firminhac is a mining engineer, and a Director of the French Gas-Engine and Mechanical Constructions Company; and M. Breittmayer is the Chairman of the Union des Gaz, and a Past-President of the Société Technique.

THE EFFECT OF IMPURE MATERIALS IN THE AMYL-ACETATE LAMP.

A recent number of the *Journal of the Society of Chemical Industry* contained the following abstract (prepared by Dr. F. S. Kipping) of a communication on the above subject by Herr F. von Hefner-Alteneck, which had appeared in the *Journal für Gasbeleuchtung*.

As the question of the effect of impure materials on the illuminating power of the amyl-acetate lamp has lately been raised, the author has made a number of experiments in this direction with samples of amyl-acetate containing various impurities, which were likely to be either present in, or added to the commercial article. A sample of amyl-acetate, to which castor oil was added in such quantities that the adulteration could not be detected by a specific gravity determination, was also investigated. The following results were obtained:—

Sample I.

Composition { Amyl-acetate . . . . 80 per cent. / Fusil oil . . . . . 20 „ }	Moist.
Specific gravity at 15° C.	0·8645
Boiling-point	106·5° to 142°
Boiling-point with reflux condenser	106·5°
Liquid consumed in half an hour after ignition . .	4·98 grms.
Deviation from the normal consumption.	+ 6·9 p. ct.

Illuminating power clearly too low—on the average about 2 per cent. Position of wick a little higher than the normal.

Sample II.

Composition { Amyl-acetate . . . . . / Diamylene . . . . . }	98 p. ct. / 2 „
Specific gravity at 15° C.	0·8725
Boiling-point	136° to 142°
Boiling-point with reflux condenser	139·5
Liquid consumed in half an hour after ignition . .	4·62 grms.
Deviation from the normal consumption	−0·8 p. ct.

Illuminating power, on the average, the same as that of pure amyl-acetate; greatest difference, + 1·5 per cent.

Sample III.

Composition { Amyl-acetate . . . . . / Alcohol . . . . . / Castor oil . . . . . }	91 p. ct. / 5 „ / 4 „
Specific gravity at 15°	0·8745
Boiling-point	120° to 142°
Boiling-point with reflux condenser	120°
Liquid consumed in half an hour after ignition . .	4·94 grms.
Deviation from the normal consumption	+ 6 p. ct.

Illuminating power could not be determined with accuracy.

Sample IV.

Composition { Amyl-acetate . . . . . / Isobutyl-acetate . . . . . / Amyl-alcohol . . . . . }	80 p. ct. / 10 „ / 10 „
Specific gravity at 15° C.	0·860
Boiling-point	133° to 142°
Boiling-point with reflux condenser	133°
Liquid consumed in half an hour after ignition. . .	4·64 grms.
Deviation from the normal consumption	−0·4 p. ct.

Illuminating power practically the same as that of pure amyl-acetate; on the average, 0·4 per cent. higher.

Sample V.

Composition { Amyl-acetate . . . . . / Alcohol . . . . . }	50 p. ct. / 50 „
Specific gravity at 15° C.	0·8408
Boiling-point	81° to 142°
Boiling-point with reflux condenser	81°
Liquid consumed in half an hour after ignition . .	6·46 grms.
Deviation from the normal consumption	+ 39 p. ct.

Illuminating power about 40 per cent. too low.

Sample VI.

Amyl-acetate	Pure
Specific gravity at 15° C.	0·8735
Boiling-point	136° to 142°
Boiling-point with reflux condenser	139·50
Liquid consumed in half an hour after ignition . .	4·66 grms.

The composition of the above samples is given by weight.

The quantity of liquid consumed was determined by first burning the lamp for about 15 minutes; the flame being carefully adjusted to the normal height. The lamp was then extinguished, weighed, lighted again, and allowed to burn for exactly half an hour; the loss in weight was then determined, with the results given above. The height of the barometer varied during the experiments from 767 to 758 mm. (30·68 to 30·32 in.) and the temperature from 15·5° to 20° C. (60° to 68° Fahr.).

The results of this investigation, taken in conjunction with others previously published, show that, for all practical purposes, the illuminating power of the amyl-acetate lamp is not appreciably affected by the employment of commercial amyl-acetate containing the most frequently occurring impurities. In the case of those impurities which have a considerable effect on the illuminating power, the rate of consumption is also materially altered. Increased consumption may, however, be accompanied by a decrease in illuminating power, and *vice versâ*.

GAS *V.* STEAM ENGINES FOR MOTIVE POWER.

We have received from Mr. J. Emerson Dowson, M. Inst. C. E., the following particulars of a trial of a 60-horse power (nominal) Crossley gas-engine, with Dowson gas plant, conducted by him at the flour-mills of Messrs. Mead and Sons, Lot's Road, Chelsea, on the 5th inst.

The maximum indicated horse power of the engine was 173·6; the estimated brake horse power, 147·6. The diameter of the cylinders was 17 inches; the length of stroke, 2 feet. The trial lasted eight hours (from 9.40 a.m. to 5.40 p.m.). The total number of revolutions made by the crank-shaft during the trial was 74,751, or 155·73 per minute. The number of explosions in the left cylinder was 25,908, or 53·975 per minute; in the right cylinder, 26,619, or 55·456 per minute. The mean pressure of the indicator diagrams of the left cylinder was 79·90 lbs. per square inch; of the right cylinder, 77·91 lbs. (1) The mean indicated horse power developed in the left cylinder during the trial was 59·30; in the right cylinder, 59·41—total, 118·71. The maximum indicated horse power which would have been developed if the engine had worked at the normal speed of 160 revolutions per minute, and fully loaded, would have been 173·6. The mean temperature of the gas in the bags near the engine was 67° Fahr.; of the air supplied to the engine, 50° Fahr.; of the water overflow from the left cylinder, 125° Fahr.; of that from the right cylinder, 119° Fahr.; and of the boiler feed water, 75° Fahr. The mean pressure of gas in the holder was 1⅛ inches; that of the steam in the boiler, 48 lbs. per square inch. The levels of the water and the fire in the boiler, of the fire in the generator, and of the gasholder, were all the same at the end as at the commencement of the trial. (2) The quantity of anthracite consumed in the generator was 584 lbs.; that of coke in the boiler, to get up steam before the trial began, 30 lbs.; do. during the trial, 140 lbs. (3) The quantity of anthracite put in the generator on the morning after the trial, to make up for the waste during the night and when raking out clinkers, was 136 lbs., of which 30 lbs. was returned as good; leaving 106 lbs. The anthracite consumed during the trial was at the rate of 0·615 lb. per indicated horse power per hour; do. with the addition of four-fifths of that which was put in the generator on the following morning, 0·7 lb.; (4) do., with the further addition of the coke used in the boiler, including the getting up of steam, 0·883 lb. The gas burnt was at the rate of about 63 cubic feet per indicated horse power per hour. (5) The anthracite consumed during the trial was about 10 lbs.; the anthracite and coke together about 12 lbs., per 1000 cubic feet of gas made. For cooling the engine, 600 gallons of water were used, or at the rate of 5·03 gallons per indicated horse power per hour; for the boiler, 80 gallons, or 0·08 gallon per indicated horse power; for cleaning the gas, 112 gallons, or 0·11 gallon per indicated horse power per hour—making a total of 792 gallons, or 5·22 gallons per indicated horse power per hour. (6) The water used for gas making was 3·2 gallons per 1000 cubic feet of gas produced; that evaporated in the boiler at the pressure of 48 lbs. per square inch, 4·7 lbs. per pound of coke consumed. The oil employed for the cylinders was 1½ pints at 2s. 9d. per gallon; a like quantity, at 1s. 4d. per gallon, being used for the bearings. The coal gas burnt for heating the ignition-tubes was 4½ cubic feet per hour. (7) The following machines were worked during the trial: 1 pair of stones, 4 feet in diameter; 13 pairs of rolls (250 revolutions); 4 pairs of discs (600 revolutions); 14 ordinary, and 7 centrifugal silks; 4 purifiers; 24 elevators; 2 exhaust-fans; sundry conveyors; pump, shafting, &c.

Remarks.

(1) Eighteen diagrams were taken on each cylinder, at intervals of about 30 minutes. Each diagram gives the curves of ten consecutive strokes of the indicator. The same indicator and spring were used for both cylinders. The 100-lb. spring was a new one tested by Elliott Bros., who also supplied the counters.

(2) The anthracite employed was of the usual kind, from the Gwaun Cae Gurwen Colliery Company.

(3) The coke was procured from The Gaslight and Coke Company.

(4) As the trial lasted eight hours, instead of the usual working day of ten hours, one-fifth of the waste has been deducted.

(5) The rate of gas consumed was taken by shutting the inlet of the holder, and timing the fall of the holder 6 feet while the engine was working.

(6) All the water was pumped from the river by the engine, and run to waste. Usually the water used for cooling an engine flows to and from an overhead tank.

(7) Coal gas was employed for this purpose, because Dowson gas could not be taken from the main supplying the engine, and there was no separate outlet from the gasholder.

As the greatest load which could be put on the engine during the trial was considerably less than the engine was capable of driving, and as the engine had twin cylinders, a counter was attached to the gas-valve of each cylinder so as to count the admissions of gas, or, in other words, the number of explosions in each. It was not possible to determine the horse power absorbed by the friction of the engine itself, as there were no means of starting it except with belting and a long run of shafting, &c. Messrs. Crossley state that this friction does not exceed 15 per cent. of the maximum indicated horse power; and at the normal speed of 160, and with the mean pressures shown by the 36 indicator diagrams, the maximum indicated horse power was 173·6, and 15 per cent. of this is 26-horse power.

When good anthracite is used, the fire in the generator is not drawn more than once in two or three months, as the clinkers are raked out every day. At this mill it is usual to work the engine 15 hours a day without stoppage; so that the loss of fuel during the night, while the generator is standing, and when the fire is raked, should, strictly speaking, be spread over 15 hours. If the plant were worked night and day, as in paper-mills and other works, there would be no such loss, except when the fires are raked once every 12 hours; and this would be very small, as all that is raked out, except the actual clinkers and ashes, is either returned to the generator or burnt in the boiler. The total quantity of water fed into the boiler during the trial was 80 gallons, or 100 lbs. per hour, including that required for the feed-pump. Neither the boiler nor the steam-piping was coated; and only 4·7 lbs. of water were evaporated per pound of coke consumed. The coke employed in the boiler actually weighs nearly one-fourth the anthracite used in the generator; and it may be fairly assumed that this can be improved. However, taking the plant as it stands, and as it is worked regularly day by day, the consumption of anthracite in the generator (without allowing for waste during the night) is 0·61 lb; or, making allowance for waste, 0·7 lb. per indicated horse power per hour. Thus any mill-owner who requires steam for certain purposes, and can give the small amount required for the gas plant, can get his motive power, under the gas system, with the unprecedently low consumption of 0·7 lb. of anthracite per indicated horse power per hour. Where anthracite cannot be procured at a moderate price, ordinary gas coke of small size can be used; but instead of 0·7 lb., it will then be necessary to use about 1 lb. per indicated horse power per hour.

It may be added that the mill was formerly worked by a non-condensing compound beam engine, and that the gas-engine which has taken its place has worked regularly for nearly four months. The work of the mill varies very little; and it is satisfactory to know that the consumption of fuel during the trial agrees with the average.

The Management of the High Wycombe Gas Company.—Mr. Charles King, whose death was announced in the JOURNAL a fortnight ago, has been succeeded by Mr. T. W. Thurlow, the Assistant Manager; while the post of Assistant Secretary has now been conferred upon Mr. F. Turner, who has been in the employ of the Company for a number of years.

Mr. Richard Williams, an old and respected citizen of Exeter, who died last Sunday week, at the advanced age of 85, was connected with the Exeter Gas Company for the long period of 63 years, during 43 of which he held the position of Secretary. On resigning this office he was appointed a member of the Board; and, being a man of strict business habits and good judgment, he gained the confidence and respect of his colleagues.

"Nos Eclairages" is the title of a little *brochure* from the pen of M. Jules Buse, *fils*, in which he treats in a popular style the three sources of artificial light—electricity, gas, and petroleum oil—devoting by far the larger section of his work to gas, the advantages of which, as compared with the other lighting media, are set forth. Certain appliances by which gas can be consumed economically are illustrated. The book is issued from a printer's in Ghent.

Flame Coloration.—At a recent meeting of the Chemical Society, Professor Smithells described a method of widely separating the two cones of combustion which constitute the flame of a Bunsen burner (see *ante*, p. 68). He has since given the Society a preliminary account of some novel experiments he has carried out on the origin of flame coloration. Trying the effect of introducing metallic salts into the two cones separately, he has found that in most cases no marked differences of coloration are produced. But in the case of copper salts, the inner cone assumes merely a general yellowish luminosity, while the outer cone is brilliantly tinged with the green colour commonly ascribed to the vapour of copper or copper salts. Of the two cones, the inner one is by far the hotter. The chief difference between them, apart from this, is that the inner one is surrounded by an atmosphere containing carbon dioxide, carbon monoxide, water, and hydrogen, but no uncombined oxygen; whereas the outer one is bounded by atmospheric air. The only explanation of the phenomenon that has yet offered itself is that the production of the green colour is connected with the act of oxidation. Further support is lent to this view by the fact that, if copper oxide dust be introduced into the inner cone, a general luminosity devoid of green is produced, but at the same time the outer cone is coloured green. It would appear as if the copper oxide were reduced to metal in the inner cone, and simply glowed as a solid body; the copper being thereupon reoxidized in the upper flames in contact with the air. The hypothesis is therefore tentatively put forward that some flame colorations are at any rate due to ether disturbances accompanying the act of chemical combination, and are not to be ascribed to the mere incandescence of single substances. Further experiments made with the apparatus are conformable to this view; but Professor Smithells has commenced a spectroscopic study of the subject, and has in view the prosecution of independent methods of inquiry. Understanding that the flame-dividing apparatus is likely to come into general use, he has been led to give this preliminary account of the experiments.

THE PRODUCTION OF AMMONIA, TAR, AND HEATING GAS.

A recent number of the *Iron Age* contained the following article by Mr. Alphonse Hennin, of Springfield (Ill.), on the above subject:—

The formation of ammonia during the distillation of coal in closed retorts is well known by gas manufacturers. The phenomena which produce the ammonia are, however, less known, because the study of the percentage of nitrogen in the coal, and of the transformation of that nitrogen into ammonia, is of comparatively recent date. It is only since the practical extraction of ammonia has acquired some importance that scientists have given particular attention to the question.

The ammonia does not exist as such in the coal, or at least the traces found in a native state are so small that they must be considered as an insignificant quantity. Nevertheless, it is found that as soon as the coal reaches a temperature of about 1800° Fahr. in the retort, a large quantity of ammonia is present in the gas; and this phenomenon lasts as long as any volatile matter is distilling. Higher temperature does not seem to render the distillation more active, or increase the quantity of ammonia; but as soon as the temperature falls below the bright red heat, the ammonia disappears from the products of distillation. This goes to demonstrate that the ammonia in the distillation of coal is a secondary product, resulting from a combination of the elements of the coal, occurring only under certain conditions.

It is a well-known fact that ammonia is formed when the nitrogen meets the hydrogen in its nascent state, or when both meet in that state. The nitrogen exists in the coal in the proportion of 1½ to 2 per cent., and appears to be one of the constituents of an organic compound. The formation of ammonia takes place when the coal reaches the bright heat. A distillation made below that temperature does not produce ammonia. Some nascent hydrogen must be in contact with the nitrogen at that particular temperature. It is not derived from the hygrometric water, for that water is vaporized long before the coal has reached the proper temperature for the formation of ammonia. On the other hand, the hydrogen of the coal exists in combination with the carbon, and is set free only during the reactions known as pyrogenous. It cannot, then, from this fact, participate in the formation of ammonia. There must be another source of hydrogen; and it is found in the water of combination of the coal.

It is known that water vaporizes only when the decomposition of the coal is already far advanced. From this fact and the preceding remarks, it seems evident that the ammonia is formed during the distillation by the combination of the nitrogen in the coal with the hydrogen of the water of combination. This conclusion is corroborated by the fact that only a very limited formation of ammonia takes place in the closed retort; it does not exceed 10 per cent. of the total nitrogen of the coal. During the process of coking, with recovery of bye-products, in ovens of the retort type, the production of ammonia is also very low from the same cause. In blast-furnaces, however, where raw coal is used, and although all the coal is consumed, the production does not exceed 15 per cent. of the total nitrogen in the coal; and it seems to be in proportion with the increased supply of hydrogen derived from some water of combination existing in the iron ore and flux, and perhaps from water carried into the furnace with the air-blast.

The production of ammonia in the process of manufacturing gas is a matter of great interest. If all the nitrogen of the coal could be converted into ammonia, the value of this product itself would yield handsome profits on the operation. Indeed, a coal containing 1¾ per cent. of nitrogen would produce per ton ammonia equivalent to 164 lbs. of sulphate, which, at the actual price, would represent $5. The result is, however, not attainable in practice; and it is absolutely out of the question in the manufacture of illuminating gas, because it is not possible to reach the totality of the nitrogen without consuming the coke, which retains about 50 per cent. of that element, and because the luminosity of the gas has to be taken care of.

Long ago Dr. Grouven demonstrated beyond doubt that in a large excess of steam, when the necessary conditions of temperature, time, and contact are supplied, the nitrogen of the coal is converted into ammonia. When it is considered that this process of conversion involves the decomposition of water by carbon, the oxidation of carbon into carbonic acid and carbonic oxide, and the liberation of hydrogen, it is evident that there are there the elements of a process for producing simultaneously large quantities of ammonia and heating gas of high calorific value. Between this theoretical reaction (so well illustrated by Dr. Grouven in his analytical method of the determination of nitrogen) and an economical manufacturing process, there are, however, many difficulties to overcome. The temperature at which the nitrogenous compounds of the coal liberate the nitrogen is evidently suitable to decompose the water and produce the combination of nitrogen with nascent hydrogen; but that temperature exceeds 1800° Fahr., and is considerably above the temperature of the decomposition of the ammonia in its ordinary condition. Dr. Grouven uses quantities of steam equal to 20 or 30 times the weight of the substance. This is absolutely impossible in practice. Not only could such proportions of steam not be economically used, but it would

require an external heating of the coal to maintain the proper temperature; and this fact alone renders its application impossible. Nor can any large excess of steam be applied without decreasing considerably the value of the gas.

In the distillation of bituminous shales in Scotland, steam has long been applied with success in view of increasing the production of ammonia. It has also been applied to coal in gas-generators, with the production of ammonia as the main object; the resulting gas being of little or no value for metallurgy. Lately the use of a very limited volume of steam with air in the ordinary producers has become quite general, for the sole purpose, however, of utilizing the heat of the primary combustion to disassociate water and impart to the gas a certain percentage of energy which would be otherwise lost, but without the intention or result of producing ammonia. None of these processes realized the simultaneous production of ammonia and such heating gas as is required in the metallurgy of iron, steel, &c., where rapidity of heating and melting, with the lowest percentage of waste, is the primordial condition.

These results, after several years of study and experiment, I have accomplished. My process embodies the formation of ammonia equal to from one-half to three-fifths of the nitrogen in the coal, or from three to four times as much ammonia as is produced in the most efficient destructive distillation; the production of an almost ideal gas for regenerative gas-furnaces, either for heating or melting, glass-furnaces, &c.; and, in addition, the recovery of some 17 or 20 gallons of tar. I use ordinary soft coal in an appropriate generator; and when it is heated to the bright red heat needed to liberate the nitrogen from its organic compound, I inject through tuyeres, with a limited amount of air, a certain volume of steam, which, decomposed by the carbon, forms carbonic acid, carbonic oxide, and a large quantity of hydrogen. All the nitrogen present during this decomposition unites with the nascent hydrogen to form ammonia; and the largest part of the hydrogen remains free in the gas. During the decomposition of the steam by the carbon, numerous secondary reactions occur—some developing heat, with formation of ammonia, &c., some absorbing heat; so that when the steam is properly diffused, superheated, and uniformly injected through tuyeres converging to the centre of the glowing mass, a very limited amount of air is needed to maintain the constant high heat required, without alteration or intermission of steam and air.

When the operation is properly conducted, and skill and judgment are applied in the regulation of the temperature in the different zones, with the proper depth of coal, and when the gases are removed from the generator with sufficient velocity under vacuum, the ammonia formed, diluted with the other gases in a proportion of 1 to 1000 or more, is not decomposed, and is collected during the washing, condensing, and scrubbing. Under these conditions, the yield of ammonia corresponds to (say) 50 to 60 per cent. of the total nitrogen in the coal; and it can be collected after distillation from the water of condensation in concentrated crude liquor, sulphate, or any other form desired.

The volume of the gas produced per ton of coal can be estimated at 150,000 cubic feet. The gas resulting from the operation is practically free from sulphur, and possesses high calorific value, as is shown by the following analysis:—

Carbonic acid	10·50
Carbonic oxide	20·00
Methane and homologues	4·50
Hydrogen	38·00
Nitrogen and oxygen	27·00
Total	100·00

In addition to the above results, some 17 to 20 gallons of tar are recovered, and contribute largely to defray the expenses of the operation.

Mr. D. D. Wilson, the General Manager of the Stockton and Middlesbrough Water Board, has been specially thanked, by resolution of the Board, for the assistance he rendered in the proceedings in connection with the recent arbitration with the Kirkleatham Local Board, and for his general conduct of the business of the Board. This recorded approval of Mr. Wilson's work has been supplemented by an advance in his salary, to date from Oct. 1 last year. We learn that steps are being taken to enforce the award of the Arbitrator (Mr. H. Law) in the above-mentioned arbitration, the terms of which were noticed in the JOURNAL for the 26th ult.

Messrs. Fletcher, Russell, and Co., Limited.—A limited liability Company has just been registered, for the amalgamation of the well-known firms of Messrs. Thomas Fletcher and Co., gas engineers and manufacturers of gas heating and cooking apparatus, of Warrington and London, and Messrs. W. and A. C. Russell and Co., artistic and general ironfounders, of the Scotia Foundry, Pendleton, near Manchester, and London. The Directors of the new Company are to be Messrs. Thomas Fletcher and Alfred Clare, of Messrs. Thomas Fletcher and Co.; Messrs. William Russell, Alexander Russell, and Alexander Neil, of Messrs. W. and A. C. Russell and Co.; and Mr. R. Wallwork, of Messrs. H. Wallwork and Co., ironfounders, Charles Street, Manchester—the first five being the Managing Directors.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

The Composition of the South Metropolitan Company's Gas.

SIR,—I notice in your last issue that, in referring to the South Metropolitan Gas Company's report, you state that the Company have been using a large quantity of petroleum spirit, in substitution for cannel. Perhaps this may account for what appeared to me to be an extraordinary occurrence.

I am a customer of the Company, residing some five miles or so from the Old Kent Road works. A short time ago the gas-meter acted in a very eccentric manner; and thinking that probably it was either want of, or too much, water, I investigated the cause in the usual way. Imagine my surprise when from the syphon plug out came, not water, but gas; conveying a substance which covered my hand with what appeared to be thin tar, but which smelt very much like petroleum.

Will some reader explain the cause; or perhaps one of the officials of the Company will deign to enlighten their consumers?

Feb. 10, 1892. CONSUMER.

Lighthouse Illumination and the Stranding of the "Eider."

SIR,—Professor Tyndall, Mr. Inglis (the Secretary of the Trinity House), "Nauta," and others, have written to *The Times* on this subject.

Mr. Inglis writes to correct what he calls a misapprehension on the part of Professor Tyndall in describing the St. Catherine's light as a "steadily-shining light." It will strike most people as strange and somewhat amusing to find Mr. Inglis questioning the accuracy of Professor Tyndall in a matter of scientific nomenclature, and attributing to him an erroneous description of a lighthouse illuminant. As I happen to be acquainted with the particular apparatus of St. Catherine's lighthouse, perhaps you will allow me to say that Professor Tyndall's description of it is absolutely accurate. The light shines "continuously;" and, except when there is some defect in the carbons or machinery, shines also "steadily."

It is quite plain that Professor Tyndall's contention is that, if the beam of that light, as it passes the mariner through the annular lenses which revolve round it, were broken up, as in the case of the group flashing lights used at the great lighthouses of Galley Head, Mew Island, and Tory Island, on the coast of Ireland, wind-thrills would be produced, which, in the presence of fog, would probably be more perceptible to the mariner than the mere revolution of a "steadily-shining light" as at St. Catherine's.

From my experience of such lights, extending now over many years, and from the testimony of practical seamen, I am able to go further than Professor Tyndall, and to say that these thrills *have been seen* when the revolving light of the lighthouse itself was *absolutely* invisible. I have no doubt that the same result would follow if a group-flashing light of that kind were substituted for the present "steadily-shining" revolving light at St. Catherine's; and I have a strong opinion that, if the sky-flashing arrangement which was tried at the South Foreland, and of which Sir Leopold M'Clintock said that it produced "a striking thrilling effect which at once caught the eye," had been in use at St. Catherine's, its effect would have been observed by the officers of the *Eider* in time to enable them to steer clear of all danger. I am glad to know that the principle of sky-flashing was recently experimented upon at the Naval Exhibition, at the instance of the Shipmasters' Society, with very marked success. I think it right that your readers should know that, since the South Foreland experiments were completed, the Irish Lights Commissioners have successfully experimented with a new lighthouse burner which, in connection with special lenticular apparatus designed to suit it, will give to a lighthouse between five and six times the power of the largest light now used in the country; and, of course, the illuminating effects of the thrills from such an apparatus would be to this enormous extent greater than anything yet tried in lighthouse illumination.

Professor Tyndall throws out the suggestion that the sudden periodic dropping and lifting of an opaque screen over the electric light, if not already tried, would probably be found a vast improvement on the continuously shining light. This experiment could be made very easily, and almost without expense, and certainly ought to be immediately tried. If, instead of attempting to correct a supposed error in Professor Tyndall's description of the light, the Secretary of the Trinity House had offered to try this experiment, it would, I think, have shown that he was in some degree alive to the interests of the sailor, whose welfare it is the duty of the Trinity House to promote.

"Nauta" refers to the fact that the common flares exhibited on board the *Eider* were seen on shore when the 7,000,000 candles, the nominal light of the St. Catherine's lighthouse, were invisible at three miles distance. Either the 7,000,000 candles is a myth, or, if a reality, 7,000,000 candle power of electric light is evidently inferior to a very much lower candle power represented by a light of less intensity of a different composition. I have tested this point carefully, and have no hesitation whatever in saying that the electric light fails to penetrate fog to a vastly greater degree than the lights of either oil or gas. However much doubted some years ago, this fact is now almost invariably conceded. "Nauta" also falls into the error of supposing that Professor Tyndall spoke of a fixed light. No such expression is in his letter; nor could such an idea be in his mind, seeing that a very short time has elapsed since he wrote, in one of the magazines, a description of the revolving but steadily-shining light of St. Catherine's lighthouse, and called attention to its performance when a vessel went ashore quite close to it. I quite agree with "Nauta" as to the great value, during fog, of sound-signals; but there are states of the atmosphere where they are of far less value than good light. I have been present at experiments where this was positively proved. Sirens giving two notes, as at St. Catherine's, I have found to be misleading. Two blasts of the same note are much better than two notes of different pitch. The lessons of the loss of the *Eider* seem to me to be threefold: (1) That a sufficient number of

lighthouses should be placed on dangerous coasts. (2) That the lights should be better adapted to arrest the attention of the mariner in fog than those at present in general use. (3) That while sound-signals of the most powerful kind and distinctive character should be used, no consideration as to the usefulness of sound-signals should be allowed to interfere with the placing, at all important lighthouse stations, of the very best lights that can possibly be devised.

J. R. WIGHAM.

Dublin, Feb. 12, 1892.

Service or Distributing Reservoirs, and the Necessity for Covering them.

SIR,—The question comprised in the title to this letter is of very wide application, and must command the attention not only of the experienced water-works engineer and manager, but also of the chemist. It is well known throughout the United Kingdom that water stored in open reservoirs deteriorates very materially in the extreme heat of summer—some waters more than others. If the reservoir is shallow, vegetable growth and the production of animal life will be greater.

Service reservoirs are in most cases intended for distribution rather than for storeage; and they usually contain from four to six days' supply. The question of capacity will be determined in a different way in each township; the circumstances being mostly various. The water, being always pumped in, is in constant circulation, and invariably fresh; and a sufficient storeage is on hand to obviate any inconvenience arising from a break-down of the machinery (which should be duplicated), bursting of the pumping-mains, a long drought, or extreme frost. In or near the town to be supplied, the reservoirs are placed on the highest ground; if possible, at sufficient altitude to cause the water to reach the houses that may be built on the most elevated parts. Sometimes this is not practicable; and the water has to be pumped from the reservoir to the higher houses.

All reservoirs should be built with separate inlet and outlet pipes, so that, in the event of accident to the mains or the pumps, the contents of the reservoirs will be available. The mains should be of large capacity, whether used for pumping direct or for bringing the water from the storeage reservoir by gravitation, so that in case of repairs caused by breakage, the reservoirs may be filled quickly, or while cleaning out the dirty water may be readily drawn off. But if the trunk mains supplying the town are connected with the pumps and the reservoirs, the larger proportion of water will be sent to the consumers before it has been exposed to the light; and that which is not required for the use of the town will go to the reservoir, which acts as a safety-valve for the mains, and allows the storeage of two or more days' consumption, according to the dimensions of the reservoir.

The size of service reservoirs will be determined after carefully considering the quantity of water at present consumed per head of the population, and the method of detecting or preventing waste. It will also depend upon whether or not the town is a large manufacturing centre. The variation in the supply per head of the population is not great, except in manufacturing towns; it may be ascertained with the greatest accuracy. If water can be procured by subterranean tunnelling into a mountain, and intercepting the springs, it is obtained pure, fresh, and sparkling, of an even temperature; and it is much preferred to river water, which is cold in winter and warm and insipid in summer. There are instances where the whole supply for a town is thus obtained, and also stored in large subterranean reservoirs and tunnels.

Where there is not a site available for constructing a service reservoir at a sufficient elevation, and the erection of a stand-pipe and tank is deemed too expensive, recourse is had to pumping to supply the higher houses—sometimes over a stand-pipe, and at others direct into the mains. This object may also be effected as in the Brighton water supply, in which case the first cost is the only expense. There a water-motor pumping-engine is used in forcing water from a low-pressure reservoir to one far above the level, and the method may be explained. There are three reservoirs, one situated at Park Road; the second, at Islingwood Road, 82 feet below Park Road; and the third, at Warren Farm, 289 feet above the level of Islingwood Road. The engine is fixed at the Islingwood Road station; and the water coming from the Park Road reservoir to that at Islingwood Road, and passing thence to supply the needs of the inhabitants of Brighton below, will actuate the engine, which, being set in motion, will force a supply of water to the station at Warren Farm, not only 289 feet higher than Islingwood Road, but also 2817 yards distant from it. The economy of this arrangement will be at once apparent. The only motive power is the water, which is afterwards used by the inhabitants living on the lower level; and the only charge upon the Corporation is the interest on the purchase-money. It is entirely automatic in its action, and, having no "dead centre," stops and starts without needing any attendant to be near it. In the event of there being a sufficient quantity of water at the high-level reservoir, the engine will at once stop until more is required.

The old method of constructing open service reservoirs with sloping sides lined with clay, concrete, or rough pitched work, has passed away. It is now requisite that these structures should be built of good material, and be of first-class workmanship. It is not only because of the protection from smoke, soot, and other impurities in the atmosphere, that the covering of reservoirs becomes necessary; for it matters not how pure the water may be when pumped from the chalk or other source, if allowed to remain in the reservoir, vegetable and animal life quickly develop, and in summer time the growth spreads with extraordinary rapidity. This mossy excrescence is produced spontaneously by the action of the sun on pure water; and it makes its appearance early in the spring. The remedy for it can only be found in covering the reservoir, or building it of sufficient depth. In my experience, between 20 and 30 feet are necessary.

An investigation has recently been made into the composition of waters at various depths at some of the American water-works by the Massachusetts State Board of Health; and it has been ascertained that at 30 feet deep the water does not circulate for something like half the year, and therefore becomes less palatable than the top layers of water which are kept in circulation by the wind and rain. With many of the waters experimented upon, this was very marked. In winter the surface of the water is cooled, and the lower layers of stagnant water mixing with the decomposed organic matter at the bottom of the reservoir, rise to the surface, and give to the water an unpleasant taste and smell. The tables of analysis of water stored in cleaned and uncleaned reservoirs show a superabundance of organisms and suspended organic matter in the uncleaned reservoirs. The evidence is conclusive from these investigations that all deep-well waters should be stored in reservoirs excluded from the light and heat.

The inlet to service reservoirs should be formed as an overflow or a waterfall at the top of the reservoir. This form of cascade aërates and breaks up the water, and has a tendency to keep the whole surface in motion; cooling it, and preventing the growth of algæ. A perfect circulation of the water is often effected by directing the current in a zigzag course through alternate openings in the cross walls which support the covering arches. This kind of vaulted covering is the same as that employed by the Romans. It is carried out in a very simple manner by building a series of brick pillars throughout the reservoir, and throwing semicircular brickwork arches across, or by erecting cast-iron columns, the tops of which are provided with brackets for carrying rolled wrought-iron girders, from which spring concrete or brick arches. An overflow is necessary, to prevent the reservoir from being overfilled. An electric gauge, directly communicating with the engine-house, is also necessary, for indicating the exact height of the water.

Filter-beds are seldom vaulted over in this country, for what reason it is difficult to discern, as one would suppose it is more necessary to protect the filter than the reservoir; the former being so extremely shallow. If reservoirs are uncovered, the water should be passed through a screen of sand and gravel. This will obviate the necessity for continuous cleaning, and prove more economical in working.

From a careful consideration of many reports throughout the country, we must conclude that pure water drawn from the wells is by Nature productive of both animal and vegetable life; and if the conditions of storeage are favourable, the spontaneous growth of both is very rapid. This growth commences early in May, and continues until maturity is reached about August, when it readily leaves the sides and bottom of the reservoirs, decays, and rises to the surface, giving off an unpleasant odour in doing so. Constructing reservoirs of a depth of from 20 to 30 feet is a partial remedy for this; and cleaning them out three or four times a year is also necessary. But, whether they are built near the town or otherwise, it is absolutely necessary that reservoirs should be covered. The cost of covered service reservoirs may be calculated at about £4 per 1000 gallons capacity. The very expensive practice of building massive piers and brick arches, although it is the system mostly employed in this country, may be safely departed from, and a covering of iron or wood, with a layer of sawdust, substituted. The covering is merely to exclude soot, light, and heat, and to prevent the growth of algæ, &c.; it also keeps the water at a uniform temperature.

INSPECTOR.

Feb. 12, 1892.

Oil-Lamp Accidents.—An inquest was held at Grantham last Tuesday before the Borough Coroner (Mr. A. H. Malim), touching the death of George Bell, a labourer, which took place at the hospital on the previous day, through burns caused by the overturning of a paraffin lamp at his lodgings. The jury found that deceased was "Accidentally burnt to death by the upsetting of a paraffin lamp."—Four persons were injured by the explosion of an oil-lamp at Trowbridge last Saturday week. A woman named Knowler was replenishing the lamp when her daughter (aged five years) approached too close with a lighted candle, causing the oil to explode. Mrs. Knowler and her baby were badly burned. The girl who held the candle also received shocking injuries to her face, arms, and legs; and the sister of Mrs. Knowler was seriously injured.

The Quality of the Gas at Middlesbrough.—The minutes of the Middlesbrough Corporation Gas Committee for the past month contain a long report by the Gas Manager (Mr. David Terrace) on his investigations into the complaints which have been made of the poor illuminating power of the gas. The blame is laid upon the consumers' burners and fittings; and the report sums the matter up as follows: "Consumers imagine it is our duty to give them an abundance of light in every room, and if they do not get it, the gas is blamed; whereas, in nearly every instance, the fault lies with themselves. It is no argument to them to say that the light is good in one or two rooms and bad in others. The gas, in their view, must be bad if they do not get sufficient light through bad fittings, burners, and globes. Our contention that these are at fault is as nothing in comparison with their conviction that it is the gas; and they boldly tell you so, notwithstanding analyst's reports and otherwise. Consumers, as a rule, do not come to the fountain head to have their grievances remedied. We are always pleased to advise the consumers as to what may be wrong. When it is the service-pipe or meter, we put same in order, and point out the defects in the fittings, burners, &c."

Cagliari Gas and Water Company.—A very satisfactory statement of affairs will be laid before the shareholders of this Company at their annual meeting to-day. The receipts on revenue account for the past year amount to £23,610; and the expenditure to £11,003—leaving after the usual deduction for sinking fund and a further £1000 for the reserve fund, a net revenue of £12,607. The amount available for dividend, including the balance brought forward from the preceding year, is £16,970, out of which an interim dividend at the rate of 6 per cent. per annum was paid, amounting to £4500. The Directors now recommend a dividend at the rate of 8 per cent. per annum for the half year ending Dec 31. last, which will require £6000, and make a dividend for the year of 7 per cent. (£10,500). They also recommend that a bonus of 5s. per share be paid; and this will absorb £1875. These various payments will amount to £12,375, and a balance of £4595 will remain to be carried forward. As to the progress of the business, the water receipts show an increase of £327, when compared with those of the previous year. The receipts from gas exhibit an increase of £556; and those from residuals, £496. The unaccounted-for gas only averaged 4½ per cent. of the make over the whole year, or the same as in the previous year.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Friday, Feb. 12.

FOG AND SMOKE ABATEMENT.

Lord STRATHEDEN AND CAMPBELL presented a Bill to amend the Acts for abating the nuisance arising from the smoke of furnaces and fireplaces within the Metropolis; and it was read the first time.

Viscount MIDLETON asked if Her Majesty's Government were prepared to issue a Royal Commission "to inquire into the causes of the prevalence of fogs in London; to ascertain how far and by what means they are preventable; and to make such recommendation as, after inquiry, they may deem advisable."

Lord SALISBURY said he was afraid he could not assent to the proposal for a Royal Commission; but he would heartily support the appointment of a Committee, if the noble Lord would himself choose the members and be the Chairman.

HOUSE OF COMMONS.

Friday, Feb. 12.

LIGHTHOUSE ILLUMINATION.

Mr. LEA asked the President of the Board of Trade whether it was correct that the officers in the *Eider*, recently wrecked on the Isle of Wight coast, were unable to see the light of St. Catherine's lighthouse; whether that light was less effective in fog than the Wigham triform group flashing gas-light on Tory Island, off the north-west coast of Ireland; whether he would consider the advisability of supplementing the electric light at St. Catherine's by the vertical sky-flashing light recommended by the Shipmasters' Society of London and others; and whether, in the meanwhile, the experiment for producing thrills in fog, recommended by Professor Tyndall in his letter to *The Times* on the 3rd inst., would be tried at St. Catherine's.

Sir M. HICKS-BEACH: In the deposition made before the Receiver of Wreck by the master of the *Eider*, no mention is made of the light of St. Catherine's having been seen by the officers of the ship, which struck on Atherfield Ledge in a thick fog about 3½ miles from the lighthouse. Upon the second and third paragraphs of the honourable member's question, I have been in communication with the Trinity House, who state as to whether the Wigham light at Tory Island is more effective in fog, that this can only be estimated from the results of the experiments at the South Foreland, which were conclusively in favour of the electric light. Experiments in sky flashing, so far as they have gone, have not been encouraging for the adoption of that system; and the Elder Brethren are in communication with the Shipmasters' Society on the subject. Professor Tyndall's letter of Feb. 3 was written under a misapprehension. Very powerful and perfect thrills in fog are sent from the illuminating apparatus at St. Catherine's; a sudden flash of more than 6,000,000 initial candle power being given for five seconds, followed by an equally sudden eclipse of 25 seconds.

BILLS TO ORIGINATE IN THE UPPER HOUSE.

The Chairman of Ways and Means (the Right Hon. L. H. Courtney) reported that, having conferred with the Chairman of Committees of the House of Lords (the Earl of Morley) on the subject, it had been determined by them that the following Bills in which our readers are interested should originate in the Upper House: Ashton-under-Lyne Water Bill, Barrow-in-Furness Corporation Water Bill, Bradford Corporation Water Bill, Bristol Gas Bill, Cleator Moor Local Board Gas Bill, Glasgow Corporation Water Bill, Ipswich Corporation Bill, Kilmarnock Corporation Water Bill, Liverpool United Gas Bill, Llanbradach District and Aber Valley Water Bill, Newport Corporation Bill, North Shields Water Bill, Oxford Gas Bill, Pontypridd Water Bill, Rhymney Valley Gas and Water Bill, Southborough Local Board Gas Bill, Swansea Corporation Water Bill, Swinton and Pendlebury Local Board Bill, Tredegar Local Board Water Bill, Uttoxeter Water Bill, and Western Valleys (Mon.) Water (Gas Purchase) Bill.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Thursday, Feb. 11.

(*Before the* MASTER OF THE ROLLS *and Lords Justices* FRY *and* LOPES.)

Ungar v. Sugg.

This was an appeal by the plaintiff from the judgment of Mr. Justice Wright, varying the order of the Chief Clerk (Mr. Harwood Clarke). The action was for an injunction to restrain defendant from issuing certain threats, and to recover damages for the loss he had sustained by those threats. The action was originally brought in the Chancery Division; but, while awaiting hearing, it was transferred to the Queen's Bench Division, and was tried before Baron Huddleston and a jury, with the result that the latter found that the plaintiff had not infringed the defendant's patent. A judgment was accordingly entered for the plaintiff with costs; an inquiry being directed to ascertain the damages which the plaintiff had sustained in consequence of the Defendant's threats. This was prosecuted before Mr. Harwood Clarke, extending over fourteen days; and in the result the sum of £1348 was awarded to the plaintiff. From this finding the defendant appealed; and upon the matter being carried before Mr. Justice Wright, he reduced the damages to £500.* From this decision plaintiff now appealed; alleging, first, that the Judge had fixed at too late a date the point of time from which the damages should be assessed; secondly, that if the learned Judge was right as to the point of time, he had taken a wrong measure of damage—in fact, had made a guess, whereas the Chief Clerk had taken the damage at the actual amount proved. The defendant had given a cross notice of appeal to further reduce the damages; but this was not proceeded with.

* See JOURNAL, Vol. LVIII., p. 28.

Mr. MORTON DANIEL appeared for the plaintiff; Mr. JENKINS represented the defendant.

The MASTER OF THE ROLLS, without calling upon the respondent's Counsel, said the point the Court had to determine was whether or not the amount awarded by the Judge was sufficient. The defendant thought his patent was infringed, and consequently sent round circulars warning persons against purchasing Mr. Ungar's lamps. There was nothing wrong in this, so long as the defendant believed the infringement was going on. But in this he made a mistake, and consequently became liable for the result of the threats he had issued. He was not liable for the damage which was the result of any rumour circulating in the trade which was not the result of his act, but merely for the damage caused by his own act. The Chief Clerk, having minutely investigated the facts, took the whole of the loss upon the sale of the lamps from the time of the first threat down to the time the action was brought, and attributed to the threats every bit of loss sustained by the plaintiff. Upon the matter coming before Mr. Justice Wright, he at once saw that the Chief Clerk was wrong. Accordingly, he took what was a business-like view of the loss; and after carefully considering the whole of the facts, he reduced the amount to £500. He (the Master of the Rolls) saw no reason for differing from this conclusion, and therefore the appeal must be refused, with costs.

COUNTY OF LONDON ASSESSMENT SESSIONS.

Sessions House, Clerkenwell, E.C.—Monday, Feb. 8.

(*Before Sir* P. H. EDLIN, Q.C., *Chairman, and a Bench of Magistrates.*)

Judgment in The Gaslight and Coke Company's Assessment Appeals.

To-day the judgment of the Court was delivered in these important appeals, the hearing of which extended (with intervals) from May 25 to Nov. 18 last year; the proceedings being fully reported in the JOURNAL at the time.

The CHAIRMAN: These appeals, 128 in number, are brought by The Gaslight and Coke Company against the Assessment Commissioners of the several Metropolitan parishes into which their system of mains and service-pipes extends. The various questions arising have necessitated a very close and careful investigation of the Company's accounts of receipts and expenditure, and of the other materials furnished, for the purpose of enabling us to determine these questions, and to estimate fairly and fully the rateable value of the appellants' property. A consolidation of these appeals was properly agreed to at the outset; but the several respondent Committees were not at one upon the more material questions involved; and it has consequently been necessary to collate the conflicting estimates they have presented, as well as to consider them respectively in contradistinction to the contention of the appellants' Engineer, and the valuers called on their behalf. There have been assessment appeals of greater complexity in last year's enormous list, but certainly none of more pecuniary importance to the suitors; the difference here between the highest and the lowest of the estimates submitted for our consideration approximating closely to £600,000 in alleged rateable value, and involving, if we take 5s. 2d. as the average of the parochial assessment in the area, an annual aggregate liability for rates exceeding £150,000 a year. It will be understood that we are here contrasting Mr. Eve's and Mr. Valon's valuations with that of the Accountant of the Company—these showing the largest differences. But if we take the highest valuation presented on the Company's side, and compare it with the lowest submitted by the parishes, even then the difference in the alleged values exceeds £216,000; and the annual liability to rates, in the same proportion, would be £55,000. The importance of these appeals is therefore obvious; and I would observe that there can be no just complaint with regard to the time we have bestowed upon them. I pass on from these preliminary remarks, suggested by the peculiar nature of this litigation, to state the conclusions at which we have arrived. That there would be material differences of view in the valuation of works of such vast extent and magnitude, was to be expected; but I must be pardoned for remarking that I was not prepared for such wide divergencies of professional opinion as have been manifested in these cases. We were asked by Mr. Littler to contrast the several totals, and the component figures in the valuations presented by the respondents' surveyors, with the near approach to unanimity and accord of judgment shown by the witnesses for the appellants. We have before us a synoptical table of these conflicting views; and there could be no better proof of the inherent difficulties of the task, nor indeed any better assurance that the witnesses brought by the respondent Commissioners have exercised independent judgment in dealing with it. The more material variances are in the amounts credited for the working capital; but, wide apart as are the totals urged, it is to be observed that many of the comparisons suggested by this table would be misleading unless regard be had to the differing method pursued in the valuation. Moreover, with regard to several of the more prominent items in the accounts, the variances, when investigated in detail, will be found to affect only slightly the general result; corresponding or similar allowances having been included under different headings. I am referring to some of the more prominent items. Nor is there on either side any material difference of opinion as to the proper method of formulating the account for the purpose of arriving at a co-equal proportionate subdivision of parochial rateable value; and the form adopted in previous cases relating to the assessment of gas and water companies has been properly followed. It is not my intention to state in detail the figures at which we have arrived in respect of either of the controverted items in the computation of the working capital, or of the statutable or other deductions for expenditure claimed by the Company. We have appreciated justly, I consider, the pertinence and force of what was urged with regard to the competition to which the Company are subjected, and may be increasingly subjected, by the adoption of electric light, and by the use of other means in vogue for producing light; and, on the other hand, we have not overlooked the power of the Company to raise the price of their gas—these being important elements for consideration in estimating the lettable value of their works. We followed also, with patience and

attention, the arguments based on the tables of averages calculated on the returns and receipts and expenditure appearing in the Company's published accounts for past years; and I should hesitate to say that these tables have not been of use in this inquiry. But in awarding allowances for expenditure where the cost of labour and of materials fluctuates, and the manufacture is subject to various contingencies of an obstructive character, the figures thus educed would be unsafe guides for valuation purposes unless there be consideration of such varying circumstances. It is far safer to rely on the results of recent practical experience. It will be distinctly understood that the Court has accepted, as the substantial basis—the mean basis—for its estimates, the reports of the Company, and the returns furnished of its actual receipts and expenditure, during the twelve months ending June 30, 1890; due regard, of course, being had to the considerations arising from the circumstances affecting the expenditure during that period, as we gather them from the evidence before us. These are the values constituting the assessment of the entire property. We find the landlord's share, subject to deductions for rates, to be £620,500. We separately assess the stations and the other indirectly-productive-portions of the works at £250,000, and we assign to the directly productive portion—to the "live mains," as they have been called—the rateable value of £370,500. Now, with respect to this latter portion of the works, we think the gross value should be fixed by adding one-fifth of the rateable value, calculated, of course, after deduction has been made for rates. Thus there will be an allowance of one-sixth for repairs, insurance, and maintenance, in respect to that portion; but for the other part of the works the statutory allowance should be one-fifth. Here, for arriving at the gross value, the addition to the net rateable value will therefore be 25 per cent. The distribution between the several parishes will, of course, be according to the well-established rule. The allocation of rateable value will be proportionate to the receipts of the Company in each parish; that is to say, the distribution will be in the same ratio—the same relative proportion—as the actual receipts in each parish bear to the total receipts of the Company. It therefore follows that, as the rates have to be deducted before the net rateable value can be fixed in any parish, the distribution or apportionment of value must first be made; and there will be a proper deduction therefrom for rates, according to the poundage actually levied in each parish respectively. I suggest that an accountant should be appointed on each side for the purpose of calculating the proportionate allocations and the proper deductions for rates in each case. Here again, be it observed, these calculations have to be made in respect of the receipts of rates in the account year. Something was said on the last occasion [*ante*, p. 117], by Mr. Poland and Mr. Danckwerts, I think, with reference to the valuation of the Company's station and unproductive works in St. Pancras. Their value, be it what it may, forms part of the £250,000 ascribed to the whole of the Company's structural works in this district; and if a valuer cannot be agreed upon between the parties to assign a fair proportion of this amount to St. Pancras without appealing to the Court, we will appoint one, or, if it be preferred, deal with the matter ourselves. There is another question, and it is one of importance. The costs of these appeals must have been enormous—this being the seventeenth day of our meeting for the trial of them. We will say nothing as to any award of costs until we have before us, in juxtaposition, first, the rateable value in each parish as now assessed; secondly, the value assigned by the Assessment Commissioners; and, thirdly, the deduction therefrom claimed by the appellants.

Some discussion followed as to points which might arise on the judgment, in the course of which

Mr. Poland stated that, in one or two of the parishes he represented, it might become an important question as to what part of a main was to be treated as indirectly productive; because, of course, the particular parish in which that main was would be entitled to any benefit they could derive from it.

The Chairman said he apprehended that there would be some difficulty in this respect; and he was not at all sure that it would not be the duty of the Court to visit on the parishes which should raise such an unnecessary question, after this long investigation, the costs of it. He certainly did not understand that this was an open matter with regard to any parish except St. Pancras. It would be observed that the Court had adopted Mr. Ryde's valuation of the stations and productive mains. Mr. Ryde's own figure was £250,000; and he (the Chairman) should be very sorry to find any one of the respondent Commissioners objecting to this valuation.

The proceedings were then adjourned till the 19th inst., when the report of the accountant will be received, and any other matter which may arise on this case will be considered.

Sales of Shares.—At Worksop last Wednesday, a number of shares in the *Worksop Gas Company* were offered for sale by auction, with the following results: Five £5 7 per cent. shares were sold at £8 10s. each; twenty other shares produced an advance of 2s. 6d.; six £10 8 per cent. old shares fetched £9 2s. 6d.; fifteen similar shares, £8 12s. 6d. ——At Bury St. Edmunds last Thursday, Mr. H. Lacy Scott submitted to public competition various shares in the *Bury St. Edmunds Gas Company*. Ten fully-paid shares (1879 capital) were first sold; £17 being the top price realized. Twenty-five fully-paid shares (1849 capital) were next offered. The highest price obtained was £22; 20 of the shares being withdrawn, as were also 25 shares of the 1859 capital. ——Mr. Lees, of the Wool Exchange, E.C., recently sold 50 £5 shares (£2 10s. paid) in the *Redhill Gas Company* for £6 5s. each.——At the Auction Mart last Wednesday, Messrs. Edwin Fox and Bousfield sold some fully-paid £10 shares in the *Walton-on-Thames and Weybridge Gas Company* at £ 10 5s. to £10 10s. each, and some shares of similar value in the *Woking Water and Gas Company* at £9 5s.——At Southampton on Friday week, Mr. W. Burroughs Hill sold by auction 200 new shares in the Southampton Gaslight Company at prices ranging from £36 15s. to £37.——Last Tuesday, Mr. A. Richards sold the following shares: 77 paid-up shares of £5 each in the *West Ham Gas Company*, for £847; 90 shares, £6 paid, in the *Crystal Palace District Gas Company*, for £810; 20 shares of £10 each in the *Walton-on-Thames Gas Company*, for £210.

MISCELLANEOUS NEWS.

BRENTFORD GAS COMPANY.

The Half-Yearly Report and Accounts.

The shareholders of this Company will hold their half-yearly meeting next Friday; and the report which has been prepared for presentation by the Directors states that they have available for dividends the sum of £61,607. They therefore recommend the declaration of a dividend at the rate of 5 per cent. per annum on the 5 per cent. preference stock, of 12½ per cent. on the consolidated stock, and of 9½ per cent. on the new stock, 1881, all subject to income-tax. Referring to the works, the report mentions that the settings of inclined retorts at Brentford and Southall have been completed, and are working satisfactorily; and, with regard to the new gasholder at Southall, the unfavourable weather of the last few months has delayed its completion, but it is in a very forward state. On the subject of residuals, it is remarked that the prices obtained during the half year have been very low, owing to the state of business generally, and especially to the stagnation in the cement trade, which has materially affected the sale of coke; but as matters become more settled, it is confidently expected that business will revive, and values return to their former level. As to the appeals which the Directors have deemed it their duty to enter against the new assessments, the shareholders are informed that these have not yet been heard. In concluding the report, the Directors say that the business continues to increase in a marked and healthy manner, and to meet the ever-growing demand, they are, of course, obliged to make corresponding additions to the manufacturing plant. For this reason, they have decided to offer for sale, by tender, during the present half year, a further sum of £30,000 of new 1881 stock

Turning to the revenue account, it will be seen that there has been an increase in all the items of income, excepting from the residual products. The sale of gas produced £86,567, as against £84,320 in the corresponding half of 1890. The rental of meters and stoves amounted to £3632, as compared with £3335. The residuals yielded £22,196, as against £26,525—coke being almost entirely responsible for the difference. The items of rents and transfer fees (about £92) bring up the total receipts to £112,487. On the other side of the account, the manufacturing expenses total to £66,536; and an examination of the various items making up this sum shows that there have been some considerable increases. Coals cost something like £4000 more; carbonizing wages, upwards of £1000 more; and repairs and maintenance, £4500 more. The outlay for distribution came to £6428; for lighting and repairing public lamps, £1404; and for rents, rates, and taxes, £4734. The last-named item has increased by about £1200. Under the heading of management, £3646 was spent; and three or four other small items bring up the total expenditure to £83,731, as compared with £72,458 in the corresponding period of 1890. The balance carried to profit and loss account is £28,756, as against £41,803. The quantity of coal and cannel carbonized in the six months was 58,046 tons (of which 892 tons were cannel); and from this was produced 597,511,000 cubic feet of gas.

BROMLEY GAS CONSUMERS' COMPANY.

In the report of the Directors of this Company for the half year ending Dec. 31, 1891, which, with the accounts, will be presented at the ordinary meeting of the shareholders on the 25th inst., they state that, in their opinion, satisfactory progress has been made in the Company's business. Although the winter quarter of the past half year was on the whole abnormally mild, the consumption of gas exceeded that of the corresponding remarkably cold and foggy half of 1890 (which itself showed an increase over that of 1889 of 10 per cent.) by 4,628,000 cubic feet, or 6 per cent.; and notwithstanding that the reduction of 3d. per 1000 cubic feet in the price has benefited the consumers, and thus diminished the gas-rental by £925, the profits have been sufficient to provide, within £393, enough to pay the debenture interest and the dividends recommended. The Directors remark that the use of gas for cooking and heating purposes is also rapidly becoming more general; showing an increase in the six months to Dec. 31 last to the extent of 12½ per cent. in gas cooking-stoves, and of upwards of 100 per cent. in ordinary gas-fires. Owing to the mild season, the sale of coke and its price have decreased in comparison with the corresponding half year; and the stocks left on hand, both of this commodity and of sulphate of ammonia, are unusually large. The profit and loss account, including £1504 brought forward, shows a balance of £6174; and the Directors recommend the declaration of dividends at the same rates as last half year—viz., 11½ per cent. per annum on the ordinary 10 per cent. shares, and 8½ per cent. per annum on the ordinary 7 per cent. shares (amounting together to £5064); and that the balance, £1110 be carried forward. The extension and alterations in the mains, referred to in the last report, have been completed; and the coal elevator and conveyor has been brought into use with satisfactory results. The Directors contemplate making during the current year several alterations and enlargements of the plant on the works, and also of the mains for the supply of the Shortlands district. For this purpose they will require to make a further issue of shares in the course of the summer; and it is expected that from £4000 to £5000 will have to be raised. With regard to the manufacturing operations, which are carried on under the supervision of Mr. W. Woodward, the Company's Engineer, the accounts show that 8499 tons of coal were carbonized in the past six months; the production of gas being 83,116,000 cubic feet, of which all but 1,284,800 cubic feet was accounted for. The residual products were: Coke, 8499 chaldrons; breeze, 843 chaldrons; tar, 93,440 gallons; sulphate of ammonia, 42 tons 2 cwt. 2 qrs. The total receipts on capital account to Dec. 31 last were £138,175; the expenditure being £136,453 17s. 9d. (of which a net sum of £2924 17s. 6d. was laid out in the past six months). The balance has consequently been brought down to £1721 2s. 3d. The Company, however, still have share capital to the amount of £56,825 unissued, and borrowing powers to the extent of £17,500 unexercised.

NEWCASTLE AND GATESHEAD GAS COMPANY.

Annual Report.

From the annual report of the Directors of the Newcastle and Gateshead Gas Company, which will be submitted at the meeting of the shareholders to-morrow, we learn that the revenue for the past year amounted to £219,393, and the expenditure to £175,799; leaving a balance of £43,594 as profit. Adding to this the undivided profits brought forward (£60,651), gives an amount available for dividend of £104,245, which the Directors propose to appropriate as follows: Interest on debenture and loans, £5094; intermediate dividend of £4 12s. 6d. per cent., less income-tax, paid in August last, on £550,000 stock, £24,801; and to the payment of a similar dividend for the second half year, £24,801. These sums make a total of £54,697, and leave a balance of £49,548 to be carried forward. There is an increase in the receipts, arising principally on the gas accounts. On the other hand, the expenditure is £25,132 more than last year, caused mainly by the high price paid for coal, on which item alone the increase is £20,963. The Directors are, however, glad to announce that the coal contracts made for the current year show an average reduction of 2s. 3d. per ton, which, on the quantity carbonized, will be a very large saving, and justifies the reduction in the price of gas of 2d. per 1000 cubic feet. During the year 11 miles of pipes have been laid in extensions and renewals; 1304 new branches have been laid; and 1243 old branches renewed; 695 meters have been repaired, tested, and refixed; 208 ordinary street-lamps have been erected; 25 specially large lamps fitted for private consumers; and there is an increase of 254 cooking-stoves fixed, making the total number on hire 1289. The contract for heightening one of the holders at the Redheugh works has been satisfactorily completed; and the erection of a new holder at the same place, which will increase the storeage capacity by about 3 million cubic feet, is now in course of construction. In order still further to meet the continually increasing demand for gas, the Directors have been obliged to extend the producing power at Redheugh, and have commenced the building of a retort-house, one-third only of which will be completed at present; the remainder to be carried out as occasion may require. The Directors, having found it necessary to raise and issue further capital, have summoned an extraordinary meeting of proprietors to be held at the termination of the ordinary meeting, at which resolutions will be proposed giving them power to raise £50,000 of the additional capital authorized by the Act of 1879, in such sums, and at such times, as they may deem advisable.

PROVINCIAL GAS AND WATER COMPANIES.

From the reports and financial statements of the several Gas and Water Companies mentioned, we have extracted the particulars contained in the following paragraphs:—

Gas Companies.

In the annual report which the Directors of the Barnsley Gas Company submitted to the shareholders at their meeting yesterday, they recommended, in addition to the interim dividend, a further payment of 4 per cent. on the general capital stock and "F" shares, 3 per cent. on the "C" preference shares, and 3½ per cent. on the "D," "E," and paid-up calls on the "G" shares (less income-tax in each case). This, they stated, would necessitate the withdrawal of £1226 from the reserve fund. They also called attention to the satisfactory increase in the sale of gas, which would have enabled the Company to pay the dividends recommended without recourse to the reserve fund had not the large expenditure for coal nearly absorbed the increased earnings. The quantity of gas sold was 105,139,200 cubic feet, yielding £18,927; and the amount of coal used was 13,880 tons.

The tenth annual meeting of the Bromsgrove Gas Company was held yesterday week. The report of the Directors stated that the high price of coal had in a measure been provided for by an increase in the sales. Some further extensions had been made in the Lickey district, from which the demand for gas was steadily increasing. The revenue account showed a balance available for division of £1004, with which it was proposed to pay the same dividend as last year—viz., 7 per cent. per annum on the ordinary shares, and 7-10ths of 7 per cent. on the whole of the "B" shares. In moving the adoption of the report, the Chairman (Mr. W. Jefferies) said the Directors had been mindful of the interests of the public as well as of the shareholders, and had not advanced the price like many other companies. They hoped for a reduction in the price of coal; and the consumers might depend that it would be a very serious thing that led them to increase the charge for gas. He considered the year's operations very satisfactory. Mr. Ledbury, as a large shareholder, questioned whether the sum which was drawn from the reserve fund last year to maintain the dividend should not now be replaced, and suggested a deduction from the proposed dividend of 1 per cent. Ten years ago, with a capital of £10,000, they had a reserve fund of £600, and now, with a capital of about £20,000, the reserve fund was only £250. The Chairman contended that the dividend was justified. They had spent £600 on new purifiers and increased the insurance, and had yet earned a 7 per cent. dividend. He did not think they had been in a better position during the last 25 years. The report was unanimously adopted; and the dividend recommended was declared.

The shareholders of the Calverley and Horsforth Gas Company held their half-yearly meeting last Wednesday. In the report which was submitted, the Directors made a few remarks concerning the growth of the business. They stated that the increased consumption of gas (especially in the eastern portion of the district adjoining Leeds) had necessitated considerable enlargements of plant, and the revision and improved arrangement of the main arteries and routes of the supply of gas. In place of mains varying from 10 to 4 inches, a new main of 10 inches had been laid all the way from the works to Newlay, the lowest point in the Company's area of supply; and this had been carried forward as an 8-inch main from Newlay through Horsforth to the old gas-works at that place. The mains and branches had been so fitted with valves that, should any part of Horsforth require an increased supply, it could be furnished at once from the mains without difficulty or expense. During the year the retort-house had been entirely rebuilt, improved, and refitted. The whole cost of this had been placed to a renewal account; and altogether upwards of £1300 had been spent on renewals in the year. Improvements were also being effected in the purifying-house that would ensure the consumers being supplied with some of the best and most pure gas in the kingdom. The number of meters in use had increased by 103 during the year. In the same period £2620 had been expended on capital account, which had been met by calls on the new shares. (Some figures from the accounts were given in the JOURNAL last week.) The Directors recommended that dividends at the rate of 10 per cent. per annum should be paid on £14,000 of original stock, and 7 per cent. on £18,200 of new shares, both of which had been fully earned. The report was unanimously adopted.

The ordinary general meeting of the Chester United Gas Company was held yesterday week; the Chairman of the Company (Mr. F. L. Bagnall, J.P.) presiding. The report which was submitted stated that there was a balance of £4682 to the credit of profit and loss account, after providing for interest on loan capital and the dividend on preferential stock; and the Directors recommended the declaration of the statutory dividends in respect of the half year ended Dec. 31. It was gratifying to the Directors to be able to report that the gas supply had been ample and of good quality, and also that during the past year (as in the previous one) there had been a steady and continuous increase both in the number of consumers and in the use of gas apparatus for cooking and heating purposes, resulting in a very considerable increase in the sale of gas and of rental. There was also a larger return from the sale of residuals; but nearly the whole of the additional income was absorbed by the extra cost of coal and labour and maintenance of apparatus—leaving only an additional balance of £250 to the credit of profit and loss account for the year. Towards the end of the year, the value of residuals fell considerably; and the Directors could hardly anticipate so favourable a return from this source for the current year. The reduction to consumers by way of discount off the current rates for gas in the twelve months amounted to £1140. Taking the whole year, the Company sold upwards of 12,250,000 cubic feet of gas more than in 1890; thereby increasing the gas-rental by rather more than £1800. There was also an advance in the return from residuals of £465. The expenditure was higher by £2040 (of which £1500 was due to coal); leaving a net increase of profit of about £225. The gas unaccounted for during the year averaged 3·07 per cent. on the production. The make of gas per ton was 10,128 cubic feet. The meeting, which was of a merely formal character, was brought to a close by a cordial vote of thanks to the Chairman and Directors, passed on the motion of the Mayor (Mr. C. Brown).

The annual report of the Directors of the Ipswich Gaslight Company says that the profit and loss account shows a balance of £12,204, including the sum of £4128 brought forward from the previous year. Of this amount £3578 has been applied in payment of an interim dividend for the half year ending June 30 last. The Directors recommend a further dividend of 13s. per share upon the "A" shares, 10s. 6d. per share upon the "B" shares, and 10s. per share upon the "C" shares—making, with the interim payment, a dividend for the year of 11½, 9, and 8½ per cent. respectively. A balance will then remain of £3749. The Directors report, with considerable satisfaction, an increase of nearly 8 per cent. in the sales of gas; and coming as it does on a large increase in 1890, it is all the more satisfactory. There is also a large increase from residuals. Unfortunately all the residual products have recently fallen in value; and therefore the Directors expect a decrease under these heads during the current year. Further, all kinds of material continue high in price, especially coal; and although they hope to buy cheaper when next in the market, it is not likely that the difference in price will be very marked. In view of these contingencies, and especially of the necessity of spending a considerable amount of money this year upon larger mains, the Directors remark that it will probably be wise to raise the price of gas to 3s. per 1000 cubic feet. The continued increase in the consumption of gas renders it necessary to enlarge the trunk main from the works. The Board have therefore authorized the Company's Engineer (Mr. J. T. Jolliffe), to lay a 24-inch pipe from the works to Salthouse Street, and from thence an 8-inch pipe to Bridge Street.

At the half-yearly meeting of the Malton Gas Company last Wednesday, the Directors reported that the sale of gas during the past six months showed a small increase on the corresponding period of 1890; but, owing to the abolition of the charge for meter-rents, and a larger outlay upon repairs and renewals, the amount of profit for the half year was not so large. After making provision for interest on mortgages and reserve fund, £1622 was available for division; and the Directors recommended a dividend at the usual rate of 10 per cent., free of income-tax. They also announced that they had resolved to pay off £100 of the money borrowed on mortgage, and to use the reserve fund in its place. The report was adopted on the motion of the Chairman (Mr. S. King). In responding to a vote of thanks, the Manager (Mr. H. Tobey) said the abolition of the meter-rents was equivalent to a reduction of 2d. per 1000 cubic feet in the price of gas, which was now nominally only 2s. 10d. in the borough.

Water Companies.

The ordinary meeting of the Camborne Water Company was held on Thursday last. From the Directors' report it appeared that the total capital expenditure to Dec. 31 last was £21,333, of which £13,000 was raised in calls, and £3000 on debentures, bearing interest at the present time at 3¾ per cent. A dividend was declared in August last on the "A" shares at the rate of 8 per cent. per annum, and on the "B" shares of £5 12s. per cent. The revenue account shows receipts during the past half year for water-rents amounting to £1035. The profit on the working was £724, as against £665 in the previous six months. The report was adopted; and a dividend at the same rate as the interim payment was declared.

The accounts which were presented at the seventeenth half-yearly meeting of the Chester Water Company last Thursday, showed the largest result of any one half year during the existence of the undertaking, and a dividend was declared at the rate of 7½ per cent. per annum (free of income-tax), upon the consolidated stock, and 7 per cent. per annum upon the new ordinary stock (1874), which is the

largest dividend they are allowed to declare. The half-year's working showed a surplus of revenue over expenditure of £2686.

The accounts of the Cleveland Water Company for the past half year, which were presented at the meeting of the shareholders last Wednesday, showed a disposable balance of £2500. The Directors proposed the declaration of a dividend at the rate of 6 per cent. per annum on the original and "A" shares, and £4 4s. per cent. per annum on the "B" shares, free of income-tax, and that £250 be added to the contingent fund. These payments, the report said, would absorb £2122, and leave £378 to be carried forward. In the course of the proceedings, Mr. Simpson asked if the chief part of the additional expenditure on capital account was caused by the extension of the mains to Coatham. The Chairman (Mr. Wharton) answered in the affirmative; and then Mr. Simpson desired to know what would be the position of the Company if the Kirkleatham Local Board did not take the supply arranged for from them. The Chairman replied that the Directors were satisfied that they had safeguarded the interests of the shareholders in any event. The Vice-Chairman (Mr. Whitwell), speaking later, said that they had the best legal advice on their position; and a thorough examination of the Company's watershed showed that they could supply 200,000 gallons of pure water per day without encroaching on their storeage, which was equal to six months' supply. The report and accounts were adopted.

The half-yearly meeting of the Colne Valley Water Company was held last Tuesday, at the Charing Cross Hotel. Mr. J. R. Hollond presided; and, in moving the adoption of the report and statement of accounts (which were noticed in the JOURNAL last week), stated that the new pumping-engine had been working very satisfactorily, and had quite borne out the estimate of saving which the Directors put before the shareholders when they were about to enter upon the contract for it. The total water-rental for the half year had been £6134, as against £5795 in the corresponding period of 1890; being an increase of £339. The advance in the first half of the year was £335, which made a total increase for the entire year of £674. The saving which had been effected in the pumping expenditure during the past six months had been £511. Multiplying this by two, gave them £1022 for the year. From this had to be deducted the dividend of 3 per cent. on the new shares (£290), which left about £750 as the saving realized by the new engine. In the half year they had laid 105 fresh supplies in the general district, and 89 in the higher district; and these represented an additional income of £243. As to the quantity of water pumped, during the half year ending December, 1890, the daily supply for domestic purposes was 22 gallons per head; in the half year ending June last, it was reduced to 20¼ gallons; and in the past half year it was further reduced to 19 gallons. This he attributed to the detection of waste water by the Deacon meters. Mr. C. T. Part seconded the motion; and after a few remarks from Mr. Hepburn concerning one or two slight accidents to the new engine, it was unanimously carried. A dividend at the rate of 3 per cent. per annum was declared; and, in compliance with the wish expressed by shareholders at previous meetings that the Directors should receive some remuneration for their services, a resolution was passed to the effect that they be paid the sum of £500 per annum.

The half-yearly report of the Directors of the South Staffordshire Water-Works Company shows that the business continues to expand in a satisfactory manner. The number of houses laid on during the past six months was 1524; making the total supplied 75,224. The gross amount of water-rates was £39,210, as against £38,443 in the corresponding period of the previous year. The Directors have transferred a further sum of £1000 to the depreciation fund, which now stands at £5186. After providing for interest on debenture and preference stock, and after appropriating the £1000 to the depreciation fund, the amount remaining for division (including £3094 brought forward) is £18,334; and the Directors recommend the declaration of a dividend for the half year on the ordinary stock at the rate of 5½ per cent. per annum, less income-tax. The amount of this dividend is £14,802; and there will remain £3532 for the credit of the next six months.

The annual meeting of the Weardale and Shildon Water Company was held on Monday last week. In moving the adoption of the Directors' report, the Chairman (Mr. D. Dale) stated that there had been an addition to capital of £3629. The net revenue amounted to £28,481, including £3458 brought forward from December, 1890. The gross receipts in 1891 were £34,272, as against £32,644 in the preceding year—being an increase of £1628. The working expenses for 1891 were less by £284. This gave, with the increased receipts, a net improvement on 1890 of £1912; and it was due to this that they had been enabled to raise the dividend to 4½ per cent. per annum. The undivided profit to be carried forward was £4093. The unallotted shares (889) of the fourth issue were offered to the shareholders in November last at £3 premium, and had been taken up. The motion was unanimously carried.

The half-yearly accounts of the Whitby Water Company show a disposable balance of £2116, as against £2081 at the corresponding date of last year. The Directors recommend a dividend of 8 per cent., or 16s. per share (free of income-tax), which will absorb £1600, and leave a balance of £516 to be carried forward to next half-year's account. The Directors record the death of no less than three of their colleagues—viz., Mr. T. Thistle (who has been Chairman of the Board since 1874), Mr. T. P. Yeoman, and Mr. J. N. Clarkson.

Opposition to the North Shields Water Bill.—A public meeting of ratepayers was held at North Shields a few days ago, for the purpose of consenting to the opposition of the Town Council to the Bill of the North Shields Water Company. The Mayor (Alderman J. F. Spence), in moving a resolution to that effect, said he thought the ratepayers would all agree with him that they were already very heavily rated for water. They were paying at the rate of 1s. 6d. in the pound, which was the highest the Company were at present allowed to charge; but they proposed to increase the rate to 2s. in the pound. Therefore it was high time the Corporation were up and stirring themselves, and asking the consent of the owners and ratepayers to oppose such a large increase. Alderman Elliot seconded the motion, which was unanimously carried.

BRADFORD CORPORATION GAS AND ELECTRICITY SUPPLY.

The Financial Position of the Departments.

At the Quarterly Meeting of the County Borough Council of Bradford last Tuesday—the MAYOR (Alderman T. Priestley) presiding—Alderman F. Priestman made his usual half-yearly statement regarding the financial results of the working of the Gas and Electricity Departments.

Alderman PRIESTMAN, in the course of his remarks, said that the revenue account of the Gas Department for the half year ended December last showed an apparent loss of £868. The profit for the corresponding period of the previous year was £3238; so that there was a total difference between the two periods of about £4000. The amount of coal carbonized during the six months was 76,614 tons—being an increase of only 1475 tons—while the cost had been £49,362, or an increase of £3800. This extra cost was accounted for, not so much by the rise in the price of coal, as by the fact that the cheap contracts extending over two years had been completed, and that the price for coal in the year 1891 had been the current price. There was an increase in wages of £750; but the cost of repairs of mains and services showed a decrease of £1000. In the item of interest on loans, there was a decrease of £200; and there was a diminution in income-tax, consequent on lessened profits, of £100. The total expenditure was £97,109, as against £93,443 in 1890. On the other side of the balance-sheet, there was an advance of only £1600 in the income from the sales of gas; the amount being £66,096, as compared with £64,407 in the second half of 1890. Coke had realized £13,433; being a diminution of rather more than £1100. Tar had produced an amount less by £960 than in 1890. The present contract for tar was at the rate of 25s. 6d., while the current price was from 19s. to 21s.; so that he apprehended there would be a further reduction when the existing contract expired, unless some considerable advance took place in the meantime. The chemical works had produced £500 less than they did a year before; but there was an increase of £200 in the sale of oxide. The total income was £96,241, as against £96,681 in the corresponding period of 1890. The items he had mentioned showed the whole of the variations which had taken place on both sides of the revenue account. To this account it must be remembered that the whole cost of lighting the streets was really charged. From a statement prepared by the Lighting Inspector, it appeared that, at the end of last year, there were 7187 lamps in the borough, of which 750 were Bray lamps. It had been carefully estimated what these would cost; and he was assured that the figure would be as near as possible £21,000. The profit for the half year preceding that of which he had been speaking was £6250; so that there was virtually a profit for the year of £26,400, in spite of the apparent loss of £800 on the past half-year's trading. Everything had been charged to revenue account with the exception of the extensions at the Birkshall works now going on and the stoking machinery. There was still a balance on appropriation account of £24,975; a restoration fund in the bank untouched amounting to £25,761; and an amount for premiums on debenture stock of £1743. He believed the gas-works were in an admirable state of efficiency, and were quite capable of supplying an increased quantity of gas if required. Proceeding to speak of the Electricity Department, Alderman Priestman said he was pleased to be able to say that the anticipations expressed by him a year ago had been amply fulfilled. On July 1 there was about £100 worth of goods in stock. Salaries and wages had amounted to £726; but this included wages for a number of men who had been working in the streets. Fittings to machinery had cost £176; coals, £255; water, £23; land (in rent), £83; miscellaneous items, £158; rates and taxes, £38; bank interest and commission, £120—making a total of £1700. Bank interest and commission would not come to nearly so large a figure in future. The Borough Accountant had borrowed money at 3 per cent.; so that the interest would not have to be paid again into the bank. On the income side of the account stood the sum of £3592 for electricity supplied, and the same amount for stock on hand as on July 1. This left a balance of £2001 to the net revenue account. With regard to this account they had to pay for interest on loans £545; sinking fund, £392; income-tax, £92—making a total of £1030, and leaving a net profit for the half year of £971. The interest and sinking fund had been paid from the very commencement. The first half-year's loss on the concern was £1079; the second, £732; the third, £315; and the fourth, £30—a total of £2157. After subtracting from this £971 profit, a loss of only £1186 remained. A great many misleading statements had been made outside by people not authorized to make them. They had been made to members of the Council with a view of inducing them to think that the working of the Electric Lighting Department had been carried on at a very considerable cost and in a very inefficient manner. He was not able to say at present what the cost of coal per horse power was in the working of the engines. To carry out such a test, it was necessary to have a separate engine and boiler, to weigh the water, and weigh the coal. Somebody had stated to him that the cost was about 16 lbs. per horse power per hour. He hoped very soon to be in a position to have a test made; and he would ask some independent gentleman to verify the facts and figures. He would bring before the Council an exact statement with regard to the efficiency, not only of the engines, but of the boilers themselves. The coal which had been consumed during the half year, without reckoning the stocks at the beginning and end, which were about the same, was 865 tons, or 1,942,640 lbs. The total cost of this coal had been £342; and when he reckoned the number of Board of Trade units sold, which were 154,431, he found that the cost of coal per unit had been 12·58d., not 30d. and 34d., as he had heard it stated outside the Council. He believed it was usually admitted that a Board of Trade unit was equal to something between 1½ and 2 horse power; and so, if the matter were reckoned out, it would very soon be found what had been the number of pounds of coal consumed per horse power. The average price of coal—and this was a very important thing to take into account—had only been 7s. 7d. delivered at the works. They had to consider a great number of things in reckoning up how many pounds per horse power were burned. In the first place, there was the banking up of the boilers all the night and all the day when the light

was not on. There was also the lighting of the station. Nothing whatever was reckoned for this; and there was always in the evenings a very large amount of coal consumed for this purpose. Then there was the resistance in the mains, which was an entirely unknown quantity. But he was informed that 20 per cent. was a low estimate of the amount required to get the current through the full system before it acted; and this had to be accounted for in estimating the consumption of the lamps. Another very important direction in which coals were consumed very rapidly was in the trials of the engines. Every one of the engines before it was passed and paid for had undergone a full twelve hours' running without standing for a minute; and whenever these trials had not been satisfactory, they had been made over and over again, and the last engine, he might say, had not been passed, and had not yet been paid for by the Corporation. Therefore he could not estimate, nor could anybody else, the amount of coal used in these trials, which were of a very severe character. He hoped these figures would be closely gone into by the electric lighting journals, and that there might be a discussion upon them; so that it might be seen whether any other station was better than their own, and if so, why—in order that, if they extended their electric lighting plant, they might make any change in the system which might appear desirable. But he ventured to say that Bradford would come out, if not the best, at least among the best, economically considered, of all the stations in existence; and his own opinion was that if they had to start again, and if they were well advised, they would commence exactly on the system on which they started three or four years ago, and which system they had carried on so far successfully, and successfully not only from a scientific point of view, but, as he had been glad to be able to show, from a financial point of view as well. He moved that the minutes of the Gas and Electricity Committee be adopted.

Alderman MORLEY seconded the motion, which was agreed to.

WIGAN CORPORATION GAS AND WATER SUPPLY.

Committees and their Capital Expenditure.

At the Monthly Meeting of the Wigan County Borough Council last Wednesday week—the MAYOR (Mr. Woods) presiding—there was a discussion on the question of the various Committees reporting to the Finance Committee before incurring expenditure on capital account.

Alderman LAMB, in moving the adoption of the minutes of the Finance Committee, said there was an important matter recorded therein to which he thought reference ought to be made. It was a resolution of the Committee that all Committees of the Corporation, before incurring any capital expenditure, be requested to report to the Finance Committee what sum they proposed to expend, in order that the latter might consider the matter, and report to the Council whether the contemplated expenditure was within their borrowing powers, and, if not, what steps were to be taken to obtain such powers. Further, that no expenditure on capital account should be commenced until the Finance Committee had reported that the contemplated expenditure was within the borrowing powers of the Corporation. The matter arose, he believed, in consequence of a letter having been received from the Local Government Board, with reference to the powers that were being sought to increase the capital of the Water Committee. In the course of that inquiry, it transpired that the Water Committee had exceeded their authorized borrowing powers by a sum approaching £7000; and the Local Government Board, in their letter to the Corporation, wanted to know what explanation the Committee had to offer for having spent that money without having obtained power to do so. This was no doubt very serious; and he hoped the Committee would be able to frame such an answer to the letter as would satisfy the Local Government Board to grant the increased power sought for. The Gas Committee, he continued, had obtained power to borrow £30,000; but they were, from time to time, to procure the sanction of the Local Government Board to their expenditure. They had spent £29,424; but they had not hitherto sought the sanction of the Local Government Board, as they ought to have done. He should like to point out that they were very near the end of their tether; and they had not obtained powers to borrow money in advance of their existing unexercised powers, amounting to £500. Their capital expenditure was constantly going on; and he should like to point out to them that it was a matter of the utmost importance that they should immediately take steps to increase their borrowing powers, if it was their intention to spend any additional money. The effort to obtain these powers might supply the opportunity of getting the expenditure which had been incurred justified and allowed, but that remained to be seen. He was afraid that it was a very awkward question for the Gas Committee to answer; but there it was. Then the Sanatorium Committee during the past twelve months had already spent £1000 in excess of their expenditure for last year; and the Streets Committee had expended at least a similar sum. These two Committees had exceeded the estimates prepared at the beginning of the financial year by between £2000 and £3000. Now, it was no use preparing estimates if they were not to be adhered to and no regard paid to them afterwards; because that money could not be spent without incurring liability for its repayment. He did not know whether the spending Committees had considered how the money was to be repaid; but in all probability there would have to be an enlargement of the rate. That was an unpleasant position to contemplate, but in this case he thought it would become necessary. A corporation could not spend money without making arrangements for paying it; and he thought it wanted from time to time the exercise of very great care in that expenditure. The resolution was a step in the right direction and stipulated that there should be from time to time conferences or interviews between the various Committees and the Finance Committee. He assumed that the last-named Committee was that which was looked to to provide the means; and it was necessary that they should be informed what other Committees were spending and contemplating spending.

Mr. CHALK seconded the motion.

Alderman PEACE said that he would like to take the opportunity of saying a few words on the resolution which the Committee had passed at his suggestion. After the clear and explicit speech of Alderman Lamb, he thought it was absolutely necessary that this course should be closely followed, for the protection of the Corporation. No doubt each member of the Committees of the Corporation was charged with a certain amount of work to do; and they all did their best for the town in laying out their schemes and proceeding to carry out their work, with the result that in many cases their actual legal powers had been over-stepped for want of proper consideration. Now, this was a matter which naturally belonged to the Finance Committee; and after the large number of instances in which various Committees had spent money without having legal power to borrow, it was most desirable that a check should be put upon their financial operations by the Finance Committee.

Alderman RICHARDS said that, as the Water Committee had been mentioned, he should like to be allowed a few words in reply; and, in the first place, he wanted the Council to understand that the Water Committee were probably in a different position to that of any other. The members would remember very well that some years ago the water was in a most filthy condition, and so much so that, when the late Chairman held office, he was very much alarmed, and felt that something ought to be done. Accordingly, the work of putting the undertaking in better order was commenced, and had gone on up to the present time with the greatest possible success; and to show that the Finance Committee were thoroughly aware of what was being done, he need only mention that the Chairman of that Committee had himself visited the works and seen the improvements. Although the Water Committee had overspent their borrowing powers, he thought they were perfectly justified in doing so; for the improvements had all been so successful that, if an inspector came down to look at them, he would be able to see works equal to, if not superior to, any in the country. Again, it must be considered that they could not wait for the long, red-tape process of the Local Government Board. They were bound to get on with the work, or else be poisoned by the filth that was coming down to Wigan; and on that account alone, he asserted that the Committee were justified in doing what they did.

Mr. JOHNSON said the only objection he could find to the Water Committee spending this money was that they had not kept in view the argument that they should not nullify or set at naught an Act of Parliament.

Alderman ACKERLEY assured Mr. Richards that they all heartily approved of what the Water Committee had done; but that did not affect the importance of the step which the Finance Committee had taken. Without wishing to carp at the Water Committee, he asked them to suppose that these works had not turned out successful; what position would the Committee have been in then? The money would have been spent all the same; and it would have been a most difficult matter to get the borrowing powers sanctioned. What Mr. Richards had said, only pointed out the wisdom of the Council in adopting this resolution.

The motion was then passed.

BRIGHOUSE LOCAL BOARD GAS SUPPLY.

Proposed Extension of the Works.

Last Tuesday, Major-General C. Phipps-Carey, R.E., one of the Inspectors of the Local Government Board, held an inquiry at Brighouse into an application made by the Local Board for power to borrow £17,000 for the purposes of their gas undertaking. The plans of a proposed new gasholder-tank, retaining-walls, &c., for the construction of which the proposed loan was asked, were placed before the Inspector, and explained by Mr. J. Parkinson, the Gas Manager to the Board, who had prepared them. The Inspector read the notice calling the inquiry, and asked if there was any opposition. Mr. Parkinson replied that there was none whatever. He then, at the request of the Inspector, proceeded to give a number of statistics in support of the application. He stated that the population of the district in 1881 was 7965; in 1891, 10,276—an increase in the ten years of 2311, being the largest of any local board district in the parish of Halifax. The rateable value of the district for general purposes was £31,176. The total indebtedness of the Board on gas and water works, works of drainage, public offices, and cemetery was £24,191 13s. 5d. The gas undertaking was purchased by the ratepayers in 1846; and in 1884 a Provisional Order was obtained by which the Board were empowered to borrow £15,000 for its extension. The whole of this had been spent; and since then the Board's borrowing powers had been increased by an amount of £45,000 in respect of which the £17,000 now asked was the first application. It was made in order to erect a new holder at the works; the last having been put up in 1868. The annual production of gas in 1871 was 24,698,000 cubic feet; in 1881, 44,743,000 cubic feet; in 1891, 69,572,000 cubic feet; and the consumption was still on the increase. The bulk of the gas was consumed within the district. The existing gasholders had a storeage capacity of 140,000 cubic feet. The average consumption of gas per diem in the winter season was 400,000 cubic feet. This showed that they could not store half a day's consumption. To increase the storeage capacity, they proposed to erect a holder capable of containing 750,000 cubic feet of gas; and they estimated that this would meet the requirements of the district for the next 30 years. For some time the selling price of gas had been 2s. per 1000 cubic feet net; and the profit last year on the gas undertaking, after transferring £450 to the general district rate fund, was £1113 19s. 9d. The new holder and tank would be constructed entirely of wrought iron, and would be annular in form. The foundations would be 15 feet below the ground level; and at the bottom there would be a layer of concrete 12 inches thick. The tank would be of iron; and the holder would be in three lifts. It was estimated that the tank would cost £7000; the holder, £8000; and the remaining £2000 of the loan asked for would be spent in building the retaining walls, supplying the connections and mains to the holder, and in laying a 21-inch main. It was imperative that the work of construction should be entered upon at once, as storeage capacity at the works was absolutely needed. On one occasion during the winter now

passing, the supply failed to meet the demand made upon it; several of the mills having to remain unlighted in order that the householders and shopkeepers might have a gas supply. Even if the work were started at once, there was some doubt as to whether the new holder could be ready for use next winter.

The inquiry was of a somewhat prolonged character; the Inspector going very minutely into all the details of the scheme. He expressed his personal satisfaction with the proposal; and subsequently, in company with Mr. Parkinson and several members of the Board, visited the gas-works, where he inspected the site of the proposed holder, and expressed himself highly satisfied with the efficiency and management of the works.

THE DANGERS OF MINERAL OILS.

In the course of an interesting paper on the use of oil for lighthouse illumination, read by Mr. E. Price Edwards, of the Trinity House, at the Society of Arts last Wednesday, he alluded to the dangers attending the employment of mineral oils of low flashing-point in domestic lamps. He stated that he had just tried five different kinds of oil in lamps of similar construction, and had taken the temperature of the oil in the reservoir of each after five hours' burning; the bulb of the thermometer being kept in the oil during the whole period. Sample No. 1 had a flashing-point of 248° Fahr. with the Abel test; No. 2, 154°; No. 3, 114°; No. 4, 86°; No. 5, 76°. The temperature of the oil after five hours' burning was as follows: Samples Nos. 1 and 2, 86°; No. 3, 87°; No. 4, 85°; No. 5, 88°. The author applied a flame to the filling-hole of each lamp in succession; and from the first three there was no indication of vapour, although the flame was put completely into the reservoir. On applying the flame to the fourth, there was a slight indication of disturbance; but on putting it to the fifth, an explosion immediately took place—a tongue of flame about a foot long shooting up from the hole, and the flame of the burner being forced up the chimney by the pressure of the exploding gas in the oil in the reservoir. These tests proved that a large quantity of inflammable vapour had been formed with the fifth sample of oil; and the author commended the fact to the serious consideration of all users of mineral oils. He showed how easily an accident might occur with such oil as that standing last in the list. Supposing, he said, while the storeage of vapour existed in the lamp, the reservoir required replenishing with oil. The filling-hole would perhaps be opened, and the vapour liberated. It might then ascend to the flame through the air-holes, or be ignited by a lighted taper or match brought near to show how much oil should be poured in; and in either case the consequences would possibly be very serious. The author expressed the hope that the Legislature would, in the interests of the general public, put such restrictions on the traffic in, and the use of, all oils which give off dangerous vapours at temperatures below 100° Fahr., with the Abel test, as will prevent such oils from being distributed all over the country for general use. That oils of inferior quality are sold is evidenced by the fact that at Trowbridge only a few days ago four persons—mother, sister, and two daughters—were severely injured by an explosion, from the effects of which one subsequently died. It appears that a quart of paraffin oil had been procured from a shop in the locality, and the mother was engaged in replenishing an ordinary house-lamp, when the explosion was caused by one of her daughters (a child five years old) approaching too near with a lighted candle.

Sale of the Holt Gas-Works.—At Farndon last Wednesday week, Mr. Cunnah sold by auction the Holt and Farndon Gas-Works. They have been worked for some years by the late Mr. Hughes; and, since his death, by his executors. Bidding started at £400; and eventually they were knocked down at £500.

Electric Lighting for Blackburn.—The Blackburn Corporation have instructed Mr. T. Burton, an Electrical Engineer, to map out a large central area for illumination with the electric light. The parliamentary powers of the Corporation expire in August next; and it is intended to have at least 2000 lights going before then.

The Smethwick Gas Undertaking.—At the monthly meeting of the Smethwick Local Board last Friday, the Gas Committee reported that the sale of gas for the year ended Dec. 31 last amounted to 145,465,900 cubic feet; being an increase of 4,365,100 cubic feet over the previous year. The increase in the rental account amounted to £613. The demand for gas during the preceding winter having exceeded the productive power of the works, necessitated consideration of the question of providing such additions and extensions of plant as would enable the Committee to meet the increasing requirements on the part of the public. There has been a progressive increase in the make of gas during the past ten years, equal to about 25 per cent. Having thoroughly investigated the matter, the Committee decided to recommend the Board to adopt Klönne's regenerative furnaces, and to entirely refit the retort-house on this principle, which will increase its productive power by upwards of 50 per cent., or equal to a daily make of 1,440,000 cubic feet of gas, against 860,000 cubic feet per day by the present retorts; besides which great economies will be effected in labour, fuel, &c.—the saving in this respect being estimated at £1031 in one year, based upon last year's working. The other additions to plant which the Committee found it necessary to recommend the Board to adopt, comprised a new chimney, station meter, exhauster, condenser, washer, offices, and stokers' mess-room. Mr. Brookes moved the adoption of the report, and also a resolution authorizing the Clerk to apply to the Local Government Board for their sanction to a further loan of £9000 to defray the cost of the extensions at the gas-works as recommended by the Committee. He pointed out that it was absolutely necessary that the alterations should be made, as they were now working the existing plant to its utmost capacity; and if the consumption continued to increase in the future in a similar ratio to the past, they would soon be unable to supply the requirements of the district. The Committee considered the new furnaces would amply repay them, and that, under the circumstances, they were justified in incurring those expenses. The motion was carried unanimously.

ELECTRIC LIGHTING FOR PORTSMOUTH.

The New Scheme Agreed to.

At the recent Quarterly Meeting of the Portsmouth Town Council, the Electric Lighting Committee were successful in getting passed the report on Professor Garnett's scheme for the supply of electric light in the borough which they first presented a few weeks ago (see *ante*, p. 120). It will be remembered that the Committee recommended that the portion of the resolution previously passed by the Council adopting Mr. Shoolbred's scheme be rescinded; that Professor Garnett's scheme should be adopted; and that they should be authorized to acquire a suitable site for the central station. Alderman Ellis, in moving the adoption of the first recommendation, said Mr. Shoolbred's estimate in respect of the private lighting scheme was that each lamp would earn £1 6s. per annum; whereas it came to the Committee's knowledge that the average earnings of a lamp were only £1. They invited Mr. Shoolbred to prove his estimate; but the only English town he cited in support of the figure of £1 6s. was Bradford. He (Alderman Ellis) then went to Southampton, where the nearest electric lighting station was in existence, and found that the average earnings per lamp were only 18s. To adopt Mr. Shoolbred's scheme, under the circumstances, would probably have meant a loss of thousands of pounds of the ratepayers' money per annum. Under these circumstances, the Committee felt it was only the right thing to do to come before the Council, admit their mistake, and make the present recommendation that the resolution adopting Mr. Shoolbred's scheme be rescinded. Professor Garnett's report, he added, did not reach them for many days after this decision had been arrived at in Committee. Mr. Dittman seconded the resolution, which was agreed to. Alderman Ellis then proposed the adoption of the second clause, recommending that the scheme and report of Professor Garnett should be adopted, that he be appointed Consulting Engineer, and that Messrs. Waller and Mandeville be appointed Superintendent Engineers, the fees for both together being £1500. He remarked that the Committee were not proposing any new-fangled notion which had not been tried in other towns, but one which would, when the whole of their lights were going, give a profit of £3000 per year. Mr. Foster seconded the proposition. Sir W. Pink moved, as an amendment—"That it be an instruction to the Electric Lighting Committee to consider, and obtain information as to the possibility of utilizing tidal power for the lighting of those parts of the borough contemplated in the Provisional Order, and to report to the Council." He supported his view by reading a letter from Colonel Crease, who pointed out the value of the power of the tide at Langstone harbour. Another letter which he read was from Sir F. Bramwell, who held a similar view. Mr. Miller seconded the amendment. Mr. Fuller stated that he was satisfied the tide could be utilized; and if they could save £2000 a year by such a system, it would be worth waiting six months for. There was some further discussion on the amendment, but eventually the resolution was carried. The third clause, with respect to securing a site for the central station, was also agreed to.

ELECTRIC LIGHTING BY GAS COMPANIES IN THE COLONIES

The Rockhampton (Queensland) Gas Company's Electric Lighting Scheme.

In November, 1889, the Rockhampton Gas Company obtained an amended Act from the Queensland Government to enable them to supply electricity for all public and private purposes within the municipality of Rockhampton and the borough of North Rockhampton, including the bridge over the River Fitzroy, which separates the two townships. The Company have been carefully watching the growth of the electric lighting industry; and about three months ago they issued a circular with the object of ascertaining what success might be expected to result from the establishment by them of a central station. The townspeople responded so well, that the Company have decided to put down plant at once for the supply of electricity. For this purpose, they have purchased a very suitable site on which to erect their central station, and the supply will embrace three zones. Within a radius of 500 yards from the station, the system will be the low-tension (2-wire), at 110 volts; beyond this area it will be the alternate current transformer system; and for the public street lighting, negotiations for which have been opened up with the Council, direct currents will be employed—the lamps being placed at the intersections of the various streets. The town being laid out on the block system, like Melbourne, the lighting will doubtless be effective. Thus the station will be able to supply all demands at whatever distance. Plant for 1000 low-tension lights of 16-candle power and 500 alternate current lamps of 10-candle power will be put up to begin with. Among the first consumers are St. Paul's Church, which will be lighted by eight Brockie-Pelt arc lamps, each of 500-candle power; the Liechhardt Hotel will have 120 lights; and sundry shops, private houses, &c., will make up altogether about 850 lamps of 16-candle power. The supply will begin about July next. The whole of the work has been planned by, and will be carried out under the supervision of, Mr. A. E. Neal, the Company's Electrical Engineer. The Company will also undertake to furnish isolated installations in Queensland.

A New Water Reservoir for Wakefield.—The Water Committee of the Wakefield City Council have accepted a tender from Mr. Thomas Oliver, of Totley, near Sheffield, for the construction of a reservoir in connection with the new water-works at Green Withens, for the sum of £120,995.

Exhibition of Gas Appliances at Darlington.—An exhibition of gas cooking-stoves and gas-fires was opened by Alderman Sedgwick in the Corn Exchange, Darlington, last Tuesday afternoon. The exhibition was arranged by Messrs. Richmond and Co. Limited, of Warrington and London, through the Corporation Gas Department; and Madame Gothard, of London, was engaged to give a series of free practical lessons on cookery.

LINCOLN CORPORATION WATER SUPPLY.

An important report was submitted to the Lincoln Town Council last Tuesday week, by a Special Committee, on the different sources of supply of water for the city, and as to whether any other and better sources can be obtained. The report dealt very exhaustively with the matter; but it will suffice to give here the conclusions at which the Committee arrived. They state: "(1) That the existing water supply is sufficient as regards quantity for the present and near prospective needs of the city, and that any inconvenience produced in very dry seasons (by lowering the Fossdyke, Brayford, and the Lower Witham), in consequence of taking water from the Upper River Witham, can be obviated by a comparatively small expenditure in obtaining increased engine power at Torksey. (2) That the water now supplied to the district is, at least, a fair second-class water; and, having regard to the general health of the inhabitants within the limits of supply, and to the fact that London and many large towns take their water supply, either wholly or in great part, from rivers, and still maintain a low death-rate, the Committee do not recommend the Council to incur the cost of obtaining any new supply, even if such new supply were obtainable. (3) That it cannot be said, with even a distant approach to certainty, that any other supply of pure and wholesome water, sufficient in quantity for the requirements of the district, can be obtained at a reasonable cost. (4) That borings, as suggested by Mr. De Rance, might or might not show that a sufficient supply of water for the district could be obtained. The approximate cost of these borings and other works is as follows: At Scothern—Two wells sinking, &c., £1126; one mile of headings, £528; pumping, land, and contingencies, £1046; total, £3000; six miles of 12-inch pipes, £8500; 85-horse power engine to raise a million gallons per 24 hours, £8500—total, £20,000. At Boultham—Boring to a depth of 2020 feet, 24-inch tubes, £14,160. In case trial-tubes of 16 inches were used, the expense would be one-third less—viz., about £10,000; and if water were found, the additional outlay might then be incurred. If the water would not rise to the surface, the cost of a small engine to pump it must be added. At Collingham—Boring to a depth of 1000 feet, 24-inch tubes, £6000; nine miles of 18-inch pipes to engines, £17,424; land, &c., £500; total, £23,924. This estimate supposes that no pumping will be required at Collingham, and that the water will flow to Lincoln by gravitation; but if, as Mr. De Rance thinks will be the case, pumping should be necessary, 50 per cent. must be added to this sum, making it £35,886." On the suggestion of the Chairman of the Committee (Mr. E. Pratt), it was resolved to simply receive the report, and to postpone the discussion.

BEYROUT WATER-WORKS COMPANY, LIMITED.

The Annual General Meeting of this Company was held on Tuesday last at the Offices, 17, King's Arms Yard, E.C.—Mr. E. EASTON in the chair.

The report which was presented stated that the gross revenue for the past year amounted to £12,474, against £12,282 in the previous year; being an increase of £192. After making proper allowances for proportion of cost of new machinery and depreciated value of stores, and carrying £1000 to reserve for contingencies, a net balance remained of £6829.

The CHAIRMAN said that the report showed that the business was steadily, although perhaps slowly, extending; and taking into account the visitation of cholera on the Syrian coast during the year, the Directors were fully satisfied with the progress made. The gross revenue exhibited an increase; and if they could obtain what they were seeking for—an extension of the concession—this increase would be of great importance in the future.

Mr. J. MORRIS seconded the motion.

The CHAIRMAN then read a letter from a shareholder (Mr. R. Canton), in which he commented upon the unsatisfactory results of the working of the concern. They had now, he said, reached the twentieth year of their existence; and there was still no prospect of paying a dividend. This being the case, he suggested that perhaps arrangements could be made with the Trust which had been formed for the purpose of acquiring water companies' properties for taking over the concern, as he believed that such a Trust could better afford to wait for their profits than private individuals.

Mr. MORRIS said that the Directors had been trying to get the concession extended; and it would be a very great boon to the Company if they could get another 30 or 40 years added. Their present concession was for 40 years, 20 of which had already run out. The troubles in Turkey and Egypt had brought them into their present difficult position; and if they could get an extension of the concession, they might suggest to the shareholders some means of reconstructing the Company.

The CHAIRMAN remarked that he did not think any Trust would care to take over the property. The income, however, was steadily increasing; and if they could be sure of that income for 30 or more years, they might be able to make the shares to a certain extent valuable. The Directors had not received any fees for the past 16 or 17 years.

After further discussion, the resolution was carried.

The retiring Directors (Messrs. Easton and Morris) and the Auditors (Messrs. Moore and Son) were re-elected; and the proceedings then terminated.

Business Change.—Mr. A. Russell, who was formerly with Mr. R. Marshall, of Glasgow, has joined Mr. T. Marks in business as cannel and gas coal merchants, at 53, Waterloo Street, Glasgow.

A New Gasholder for Swansea.—Owing to the demands which are made upon them, by the growth of the town and the outlying districts, the Swansea Gas Company have found it necessary to extend their storage accommodation. In consequence, they have placed in the hands of Messrs. John Aird and Son the contract for a new holder, which will be capable of containing nearly a million cubic feet of gas, and which they hope to complete in about twelve months.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

When making my remarks last week upon Dr. Ivison Macadam's testing of the gas supplied in Edinburgh and Leith, I was unaware whether the gas he tested at 56, Hanover Street was from the Edinburgh or Leith works. The premises are in the Leith district, but very near its outer edge; and as the coupling up of the mains has not yet been fully carried out, it would have been dangerous to say, offhand, from which of the works the supply to them was derived. I have now learned, on reliable authority, that both the gases Dr. Macadam tested were from the Edinburgh works. The discrepancy of two candle-power, I presume, arose from the tests not having been made at the same time; and from the fact that the apparatus used at Hanover Street was only temporarily fitted up. I understand that Dr. Macadam made only one test, which was not sufficient. It is but just to him, however, to say that he did not put forward the result as indicating any delinquency on the part of the Gas Commissioners. He had but a very limited commission from the Merchants' Association; and no one would know better than himself that he was treading upon very slippery ground in making a single test in a building not fitted up for testing purposes and with temporary appliances. Had he been a less capable man, he would probably have denounced the Gas Commissioners for the difference in illuminating power; but he not only did not arrive at an adverse conclusion himself, but he carried the Merchants' Association with him.

A statement has got into one of the local evening papers this week to the effect that, owing to the extra outlay for coal, &c., it is feared that the price of gas in Glasgow is likely to be advanced 3d. per 1000 feet, thus bringing it up to 2s. 9d. The writer of the paragraph says he has been told that this should have been done last year, if the Gas Committee had had the courage to face the public. He asks, What says the Convener, or rather ex-Convener, to this? I suppose the question is put to ex-Bailie M'Laren, who was long the active and enthusiastic Convener of the Finance Committee, but is not now a member of the Town Council. That gentleman does, I am aware, entertain the notion that the price of gas will have to go up in Glasgow. We shall see by-and-bye.

The Watching and Lighting Committee of the Kilmarnock Town Council recently agreed to offer the Corporation Gas Committee a lump sum of £650 on account of gas for lighting the existing public lamps during the coming season (inclusive of the illuminated clocks,) the quantity of gas allowed for each lamp to be 2½ cubic feet per hour; a like proportion being paid for any additional lamps that may be erected. When the proposal came before the last meeting of the Town Council, Bailie Wilson said that the question of street lighting had been before the Watching and Lighting Committee for some time; and he thought it must be admitted by those persons who were in the habit of watching the street lamps, that the amount of light given out by them was ridiculously small. During the last twenty years, the gas consumers had reduced the debt by £22,000. Surely, then, it was quite reasonable for the Committee to expect, seeing that the public had paid that amount of money, that they should get some little benefit from the gas-works. They were asking 2½ cubic feet of gas per hour instead of 2 feet as at present. The speaker went on to say that they had plenty of precedents to go by—Greenock, Hamilton, and Paisley all subsidized local taxation to a large extent; and he did not think that the Gas Corporation, in agreeing to the proposed arrangement, would be doing more than their duty to the inhabitants of Kilmarnock. Mr. James Browne, Convener of the Gas Committee, was of opinion that the question should not have been brought before the Council until the Committee had had time to discuss it; but Bailie Wilson submitted that it was desirable to get a recommendation from the Council, as it might have some influence on the Committee.

At the same meeting of the Council, there was submitted by the Gas Committee a statement of accounts in connection with the gas-stove department from its commencement up till last month, as prepared by the Town Chamberlain. This showed that the total expenditure had been £598 15s. 7d.; the income in all amounting to £205 12s. 5d. —or an excess of expenditure of £393 3s. 2d. Against that there was £332, as purchase price of stoves on hire, together with 12½ per cent. profit on gas sold for fires, stoves, &c. (£34). These two items reduced the loss to £25 10s. The Gas Committee's report went on to say that during the month from Dec. 14 to Jan. 14 there had been manufactured 12,193,800 cubic feet of gas; being an increase over that of the corresponding month of 1890-91 of 1,196,800 feet. The illuminating power of the gas was an average of 26 standard candles.

I have frequently observed friction among the members of the Dunbar Gas Commission; but the matters in dispute were not, as a rule, worthy of being taken notice of here. This week, however, a subject has been started which is both important and unpleasant. At Wednesday's meeting of the Gas Commissioners, Bailie Anderson, the recently appointed Convener of the Gas Commissioners, made a long statement in which he alleged that he had discovered that the coal supplied to the gas-works was short in weight. In one lot of invoices, he had found 2 tons 12 cwt. of shortage, in a second 2 tons 2 cwt., and in another 11 cwt.; but that in the last two waggons he found an excess of 5 cwt., while another waggon was 6 cwt. over weight. Bailie Anderson complained that Mr. Cuthbert, the Gas Manager, did not keep him informed as to what was going on, but acted on his own responsibility. He also stated that their coal contracts for the year were nearly exhausted, and asked for instructions. Mr. Smith, the late Convener, defended Mr. Cuthbert, who, he said, was very reliable and a man of great experience; and he characterized Bailie Anderson's action as "downright spite" towards the Manager. An unseemly wrangle went on for some time, out of which nothing came except that the Gas Commissioners were empowered to deal with the matter of the coal supply. It transpired that the coal contractors had been written to with reference to the shortage. They had expressed surprise, and stated that they went by the colliery weights, which were correct; and they wished to have the railway company's weights to submit to the collieries. It was evident that Bailie Anderson proceeded upon the railway company's weights; and without saying

anything against their accuracy, it is just possible that the short weight might be attributable to the risks of transit. There can be no doubt that the colliery weights, are accurate; and if the coal sent out is not delivered at the gas-works, it must have disappeared on the road—for which the railway company ought to be responsible. To a small gas-works, a few tons of coal are a matter of consequence; and Bailie Anderson is right to insist upon exactitude in weight. I scarcely think, however, he was justified in his tone towards the Gas Manager. It is certainly the Manager's duty to report to him whatever he may discover to be going wrong. But the Convener should also keep his eye upon all that goes on; and if short deliveries of coal have been going on for some time, he ought to have found it out and checked it sooner than he did.

Mr. Whimster, the veteran Engineer to the Perth Gas Commissioners, is in trouble again with reference to the capacity of the gas-works. A few years ago, somewhat extensive additions were made to the retort-house and storeage portions of the works; and these have been, and are still, sufficient to cope with an increased output—the present trouble being, as it is in certain other places, with the disposal of the spent lime. This is difficult to sell; and in the Perth works it has accumulated to such an extent that storing it is complained of as costly. In a report which Mr. Whimster has submitted to the Works Committee on the subject, he recommends that either the lime should be recalcined, or that the purifiers should be added to and rearranged, so that, by the partial use of oxide of iron, the quantity of lime required might be considerably reduced. The matter was reported to the Gas Commissioners on Monday night; and they instructed the Works Committee to consider it in conjunction with reports submitted by Mr. Whimster on the same subject in the years 1887 and 1890.

As I have for some time anticipated they would, the Police Commissioners of Inverness have for the present given the *quietus* to the hasty proposals which were being made to have a portion of the burgh lighted by electricity. The proposal seemed to be little more than the fad of one member, Bailie Jonathan Ross. It was knocked on the head by Mr. W. J. Smith, who brought out that Bailie Ross's Special Committee had expended £142 16s. 7d. upon preliminary inquiries, and had not been able to produce a feasible scheme—in fact, were not even able to agree upon the system of power which they would adopt in the event of their going in for an installation. Mr. Smith thought they made a mistake at the beginning in employing engineers who knew nothing about electricity. The proposal was made by Bailie Ross that they should continue their investigation by consulting a practical engineer. Provost Ross was opposed to their going any further with the inquiry in the meantime. His information, he said, was that an electric lighting scheme would cost between £30,000 and £40,000; and he thought they must just tell the community that the electric light was impossible in the present circumstances. By nine votes to eight the Commissioners discharged the Special Committee. The corollary to that resolution was the confirmation of the resolution of the Gas and Water Committee to proceed with the enlargement of the gas-works. An attempt was made to get the Commissioners to agree to a modified scheme, whereby £2300 less would be required; but in view of the rapidly increasing consumption of gas, it was thought advisable to proceed with the proposal of Mr. Thomson, the Gas Manager. The Commissioners do well to place their confidence in Mr. Thomson, who has conducted the business with marked ability in all its departments, and particularly in the working of the sulphate of ammonia plant, which is their latest addition to the works. The extension of the gas-works is to be proceeded with at once.

An interesting little function took place a few days ago in the old retort-house of the Dalmarnock works of the Glasgow Corporation. Mr. Robert Dobbie, one of the foremen (in which capacity he has served for over twenty years) celebrated the fiftieth anniversary of his wedding day; and it was decided among his workmen to present him with a golden wedding gift, in the form of a purse of sovereigns, an ivory-handled Malacca walking-stick, and a pair of gold-rimmed spectacles for his good lady. These were handed to Mr. Dobbie in due form by Mr. Manwell, the Works Manager, in the presence of Messrs. Patterson, Warden, Frane, M'Intyre, and Craig, and a gathering of about 400 of the workmen.

My attention has been called to a mistake which was made by Mr. Kenneth Fraser, the Convener of the Gas and Water Committee of the inverness Corporation, and which was reproduced in this column on Jan. 12, in a statement to the effect that their output of gas was Increasing at the rate of half-a-million cubic feet per annum. The annual increase, I am informed, is from 3½ to 4 million cubic feet.

The dispute between the Falkirk and Larbert Water Trust and Messrs. D. Y. Stewart and Co., of Glasgow, the contractors for the recently-constructed water-works for the district, was to have been brought before Mr. J. M. Gale, M. Inst. C. E., of Glasgow, as Arbiter, in Edinburgh, last Tuesday; but on the previous day a settlement was effected, which obviated the production of evidence. The terms agreed upon are that the contractors acknowledge that the works have not been completed in the terms of the specifications; and they agree to pay to the Trustees such sum by way of damages as may be fixed by Mr. J. Watson, of Bradford, and Mr. J. Wilson, of Greenock.

Gas Meter Inspectors' Dinner at Liverpool.—Last Tuesday evening, the Liverpool Gas Company's meter inspectors and their friends, presided over by Mr. J. Grisenthwaite, Superintendent of the Department, had dinner together at the Pembroke Hotel. The usual loyal and patriotic toasts having been given, the health of the Treasurer of the Company (Mr. J. F. Robinson) was heartily drunk with musical honours. The Chairman then made some remarks about the Company and also the automatic gas-meter. He referred to his remarks at the last annual dinner, when he anticipated that about 2000 would be fixed during the ensuing year; and he was pleased to say that his anticipations had been realized, with 600 over, making 2600 fixed, and 1077 applications still on the Company's books awaiting attention. The remainder of the evening was pleasantly passed in listening to some well-rendered songs and instrumental selections.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 13.

Sulphate of Ammonia.—The market does not show increased activity. Still spot parcels keep moving off fairly; but, in consequence of the low quotations made for second-hand parcels, prices are somewhat easier. At Hull and Leith, business is reported at £10 8s. 9d.; and at Liverpool, dealers have accepted £10 6s. 3d. to £10 5s.—a price which does not harmonize with the figures obtained at the works for good Lancashire makes. At the close, there is rather more inquiry; and a further decline is therefore not foreseen. The dulness of the Continental demand is freely commented upon; but the fact is generally overlooked that the orders have been taken by the speculators. Nitrate offers at 9s. 6d.

LONDON, *Feb.* 13.

Tar Products.—Considerably more business in the lighter tar products is reported. Benzol is realizing a better price; and solvent naphtha is in greater request. Toluol, however, remains neglected; but if producers would only take care that the difference between the value of 50's and 90's benzol was kept in parity, toluol would improve. It must not be forgotten that carbonizers do not produce toluol. Creosote and common oils continue to be a drug. But producers are now burning them as fuel very largely; and this, taken in connection with the lessened production, will soon relieve the glutted stocks. There is more inquiry for creosote oils; but the price for it does not tempt distillers. Carbolic acid is moving off slowly; but as there are no stocks, and the demand is still fairly good, it is hoped the value will improve with the advance of spring. Anthracene continues a "dead letter." Several important contracts for tar have been let, at prices ranging between 16s. and 20s. The average prices for the week may be taken as follows: Tar, 18s. Pitch, 33s. Benzol, 90's, 2s. 5½d.; 50's, 1s. 9d. Toluol, 1s. 4½d. Solvent naphtha, 1s. 3d. Crude benzol naphtha, 30's, 1s. Creosote, nominal, 1d. Crude naphthalene, 30s.; hot pressed, 40s. Crude carbolic, 1s. 1½d. Crystals, 5½d. Creosote, 8½d. Anthracene, 30 per cent., "A" quality, 1s.; "B," 8d.

Sulphate of Ammonia.—Makers are beginning to despair of any improvement in this market. Business is difficult; and the demand seems to be remarkably slack for the time of the year. This is all the more curious, since nitrate is not only firm and dear, but in some ports distinctly scarce. All sorts of prices are quoted; and business has actually been done at £10 to £10 8s. 9d., less 3½ per cent., according to position, conditions, and delivery. Gas liquor (10-oz.) is quoted at 6s. 6d. to 8s.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The demand for nearly all classes of fuel continues to quieten down throughout this district; but except in some inferior descriptions, there is still no appreciable giving-way in prices. Supplies, however, of the better classes of coal are gradually becoming in excess of requirements for house-fire purposes; while common round coals, which are only in moderate demand, are becoming more plentiful in the market, and in many cases colliery proprietors are barely maintaining late rates. At the pit mouth, best Wigan Arley is still firm at about 12s. 6d. per ton; Pemberton four feet, and second qualities of Arley average 10s. 6d. to 11s.; common house-fire coals, 9s. to 9s. 6d. per ton. The lower qualities of round coal are still quoted at about 8s. to 8s. 6d. at the pit mouth, for steam, and forge purposes, but these are the top figures; while for shipment, good qualities of steam coal are readily obtainable at about 10s. to 10s. 3d. per ton, delivered at the ports on the Mersey. Best qualities of engine fuel meet with a ready sale, at late rates; but common sorts of slack are again hanging upon the markets, and to secure business, lower quotations are being very freely made. At the pit mouth, burgy averages 6s. to 6s. 6d.; best slack, 5s. to 5s. 6d.: medium sorts, 4s. 3d. to 4s. 9d.; and common descriptions, 3s. to 3s. 6d. per ton.

Northern Coal Trade.—The northern coal trade has been decidedly easier during the past few days; though the dread by some users of the outcome of the miners' agitation, has led to more shipments and to a little check to the decline in prices. For best Northumbrian steam coal, as low as 9s. 6d. per ton f.o.b. has been taken, and the contracts for the Swedish railways have been at lower rates. The price for the bulk of the coals, taking an average of the freight, represents something like 9s. 3d. per ton f.o.b., and that over the shipping season. For second-class steam and small steam coals the prices are correspondingly low. Gas coals are also lower on the last few days; and now about 8s. 6d. to 8s. 9d. per ton f.o.b. may be taken as the rate for best Durham gas coals, prompt delivery. For contracts over the season, a less price is being taken; so that it is clear that the rates for coals have fallen considerably. It is very doubtful what will be the outcome of the wages agitation; but its occurrence points to the desirability of stocks of coal in users' possession being well maintained. Bunker coals are lower, and the very best screened qualities have been reduced from 12s. to 11s. per ton f.o.b.; while unscreened qualities are correspondingly low. For manufacturing coals, owing to the strike of the engineers, there is now a very limited demand, and with large supplies, the price is very weak in consequence. Household coals are very dull. In coke, best blast furnace qualities are fairly steady at from 15s. 6d. to 16s. per ton f.o.b. Gas coke is very quiet—the strike at the cement works having allowed stocks to increase. The price is weaker generally.

West of Scotland.—An easier feeling is noted in the coal trade of this district; the mild weather both in this country and on the Continent is against prices. There is very little forward business reported; the transactions being chiefly of a prompt or early description. The following are last week's prices f.o.b. at Glasgow Harbour: Splint, 9s. to 9s. 3d. per ton; main coal, 7s. 9d. to 8s.; steam, 10s. to 10s. 3d.; ell, 8s. 6d. to 8s. 9d. The exports of Scotch coal during the week were 109,449 tons—an increase on the previous week of 9000 tons. For the first five weeks of the current year, the exports reached 521,933 tons; or 156,555 tons more than during the same period of 1891, when business was much interfered with by the railway strike.

Reduction in the Price of Gas at Doncaster.—At a meeting of the Doncaster Town Council last Wednesday, it was resolved, upon the recommendation of the Gas Committee, to reduce the price of gas from 2s. 11d. to 2s. 6d. per 1000 cubic feet, and to allow 3 per cent. discount upon all annual accounts from £50 to £75, and 10 per cent. upon those exceeding the latter amount. As services and meters have been fixed free, and no meter-rent charged, for the past two years, the consumers have good reason to be satisfied with the Corporation gas undertaking, the practical management of which is in the hands of Mr. R. Bridge.

Accident at the Wolverhampton Gas-Works.—Last Wednesday afternoon a distressing accident occurred to John Townsend, who is employed as a labourer at the Stafford Road Gas-Works, Wolverhampton. As a railway coal waggon was being shunted on the metals in the yard, the poor fellow accidentally fell in front of the moving vehicle, which passed over him. One of his thighs was dreadfully lacerated; and it is anticipated that amputation will have to be resorted to. He has also received other injuries to his hands and side, and had to be removed to the General Hospital. Townsend is about 35 years of age, and has been a servant of the Wolverhampton Gas Company for many years.

Electric Lighting at Hawick.—On Monday night last week, the High Street of Hawick was illuminated by the electric light. The work has been carried out by Messrs. Mavor and Coulson, of Glasgow, who are of opinion that they can light the streets cheaper by electricity than by gas, provided motive power can be obtained from Wilton Lodge. The Town Council have arranged to make a three months' experiment; and, in the meanwhile, the driving power is supplied by the engine at the sewerage works. The cost of the experiment will, it is said, considerably exceed £100. Referring to this matter, a local paper says: "The electric light experiment from one point of view has succeeded; from another—that of the public expectation—it has failed. Of course, the public might not be justified in expecting so much; but there is no question that they have been sadly disappointed. One thing is certain—the money is as good as thrown away. We are informed that the entire cost of the experiment will not be far short of £200. We hardly think it is worth two hundred pence, from a practical point of view; for we know just as much about the electric light as we knew before, and no more."

The Gas Question at Eccles and Swinton.—Last Wednesday afternoon a deputation from the Eccles Local Board met the Gas Committee of the Swinton and Pendlebury Local Board to arrange, if possible, for clauses to be inserted in the Bill promoted by Swinton, so as to avoid opposition from Eccles. Mr. Peter Hampson, who presided, said that the Swinton Board were quite desirous of meeting Eccles in an amicable manner, and would agree to anything that was fair and reasonable. Mr. George Trenbath (the Clerk to the Eccles Board) stated at considerable length the clauses which the latter Board were desirous of inserting in the Bill. These were as to the differential rate; the control of the lamplighters, Swinton to retain the control of the formanship; the quality of the gas and the raising of the standard of illuminating power from 14 candles to 18 candles (the quality given by Salford); and the insertion of a clause enabling the Local Boards to constitute a joint-gas authority, Eccles to supply their own district, as distinguished from the original scheme that it should also supply the out-districts, including Irlam, Cadishead, Worsley, and Little Hulton. After considerable discussion, it was agreed on behalf of Eccles that the proposals should be reduced to writing, in order that they might be considered by the Swinton Board.

New Offices for the Ipswich Gaslight Company.—Last Saturday week, the Ipswich Gas Company formally entered into occupation of new offices which they have erected in Carr Street. At 11 o'clock in the morning, the Directors and the Secretary and Manager (Mr. J. T. Jolliffe), with other heads of departments, assembled at the main entrance. The Architect of the building (Mr. J. S. Corder) presented a silver key to the Chairman of the Board (Mr. Sterling Westhorp); and that gentleman, after expressing a hope that good fortune would attend the enterprise, and congratulating his colleagues upon the completion of the work, proceeded to unlock the door and take possession. The ceremony was very brief and simple; but later on, an excellent luncheon was served in the Board-room. The new building has a frontage to the street of 32 feet; and up to the first-floor level, it is constructed of Scotch red sandstone. On the ground floor is the general office and the private room of the Secretary and Manager. Nearly the whole of the first floor is set apart for trade purposes. At the end of the landing, is a large Board-room in which will be held the annual meetings of shareholders. In the rear is a room in which the Directors will meet; and the whole space at the back is reserved as a show-room for gas fittings and appliances. The new offices, occupying as they do a central position in the town, will be a great convenience to the public.

Business Transfer.—The gas engineering and ironfounding business which has been for years carried on by Messrs. J. T. & B. Porter and Co., at Gowt s Bridge Works, Lincoln, has been disposed of by them to their Manager (Mr. W. Bralsford) and a gentleman associated with him in partnership, who will carry it on in future under the style of "Porter and Co.," under the personal supervision of Mr. Bralsford, who has for 23 years taken an active part in the concern.

Morris and Cutler's Patent Condenser.—This appliance, we learn, is already in use in 70 important gas-works; and Messrs. S. Cutler and Sons have in hand the third order they have been entrusted with from Manchester (for the Bradford Road station), as well as two condensers, each of 1½ million cubic feet per day, for the Belfast Corporation Gas-Works. They have also received instructions to supply others for Harrogate, Ramsgate, Brazil, and Hong Kong.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 289.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	10	16—17	..	6 3 6
100,000	10	,,	7½	Do. 7 p.c	10	11¼—12¼	..	6 0 0
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 5
100,000	20	27 Nov.	8	Bahia, Limited	20	12—14	..	11 8 6
200,000	5	12 Nov.	7½	Bombay, Limited	5	6⅞—7	..	5 7 1
40,000	5	,,	7½	Do. New	4	4⅞—5⅛	..	5 14 1
380,000	Stck.	13 Aug.	12½	Brentford Consolidated	100	210—220	..	5 11 4
150,000	,,	,,	9½	Do. New	100	157—162	..	5 14 2
220,000	20	16 Sept	11½	Brighton & Hove Original	20	40—42	..	5 9 6
888,500	Stck.	16 Sept.	5	Bristol	100	98—103	..	4 17 1
320,000	20	15 Oct.	11½	British	20	43—45	..	5 0 0
50,000	10	28 Aug.	11½	Bromley, Ordinary 10 p. c.	10	18—20	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	13—15	..	5 13 4
328,750	10	—	—	Buenos Ayres (New) Limited	10	5¼—6½	..	—
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	93—96	..	6 5 0
150,000	20	13 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	15 Oct.	13⅜	Commercial, Old Stock	100	240—250	..	5 10 0
165,000	,,	,,	10⅝	Do. New do.	100	190—195	..	5 10 3
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	118—123	..	3 13 2
800,000	Stck.	30 Dec.	13	Continental Union, Limited	100	225—230	..	5 13 0
200,000	,,	,,	10	Do. 7 p. c. Pref	100	185—195	..	5 2 7
75,000	Stck.	16 Sept.	10	Crystal Palace District	100	190—200	..	5 0 0
486,090	10	29 Jan.	10	European, Limited	10	19—20*	..	5 0 0
354,060	10	,,	10	Do. Partly paid	7½	14—15*	..	5 0 0
5,470,820	Stck.	12 Feb.	12	Gaslight & Coke, A, Ordinary	100	215—219*	+1½	5 9 7
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	94—97*	+1	4 2 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	245—250*	+2	4 0 0
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	116—121*	+3	4 2 9
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	169—174*	+4	4 6 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	148—152*	−1	4 12 1
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	241—246*	+1	4 1 3
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	145—150*	+1	4 0 0
1,061,150	,,	11 Dec.	4	Do. 4 p. c. Deb. Stk.	100	112—115	+1½	3 9 7
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	118—123	..	3 13 2
908,000	,,	,,	6	Do. 6 p. c. do	100	160—165	..	3 12 9
3,800,000	Stck.	12 Nov.	12	Imperial Continental	100	222—226	−1½	5 6 2
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	4—4½	..	6 13 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	108—110	−1	4 10 11
541,920	20	27 Nov.	6½	Monte Video, Limited	20	15—16	..	8 2 6
150,000	5	27 Nov.	10	Oriental, Limited	5	8¼—9	..	5 11 1
60,000	5	30 Sept.	7	Ottoman, Limited	5	4—5	..	7 0 0
166,870	10	26 Feb.	2	Para Limited	10	2⅜—3⅛	..	—
420,000	100	3 Nov.	6	People's Gas of Chicago— 1st Mtg. Bds.	100	100—105	..	5 14 3
500,000	100	1 Dec.	6	2nd Do.	100	100—105	..	5 14 3
150,000	10	15 Oct.	10	San Paulo, Limited	10	10—11	..	9 1 10
500,000	Stck.	28 Aug.	15½	South Metropolitan, A Stock	100	272—277	+2	5 11 11
1,350,000	,,	,,	12	Do. B do.	100	225—230	..	5 4 4
200,000	,,	,,	13	Do. C do.	100	238—243	+5½	5 7 0
725,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	138—143	..	3 10 0
600,000	Stck.	16 Sept.	11½	Tottenham & Edm'nton, Orig.	100	—	..	—
				WATER COMPANIES.				
729,331	Stck.	30 Dec.	10	Chelsea, Ordinary	100	256—261	..	3 16 7
1,720,560	Stck.	15 Oct.	8	East London, Ordinary	100	204—209	..	3 16 7
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	136—140	..	3 4 3
700,000	50	11 Dec.	8	Grand Junction	50	190—194	−1½	3 16 11
708,000	Stck.	12 Feb.	10½	Kent	100	263—268*	..	3 18 4
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	225—230	−2½	4 2 7
406,200	100	,,	7½	Do. 7½ p. c. max.	100	189—194	..	3 17 4
260,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	100	120—123	..	3 5 0
500,000	100	12 Feb.	12½	New River, New Shares	100	330—340*	+1	3 11 4
1,000,000	Stck.	29 Jan.	4	Do. 4 p. c. Deb. Stk	100	123—126*	..	3 3 6
902,300	Stck.	30 Dec.	6½	S'thwk & V'xhall, 10 p. c. max.	100	146—150	−1¼	6 8
126,500	100	,,	6½	Do. D 7½ p. c. do.	100	140—145	..	4 9 8
1,155,066	Stck.	11 Dec.	10	West Middlesex	100	245—250	−2½	4 0 0

*Ex div.

NOW READY. PRICE ONE GUINEA.

PRECEDENTS IN PRIVATE BILL LEGISLATION AFFECTING GAS & WATER UNDERTAKINGS.

1879-1890.

Compiled by EDMUND HERBERT STEVENSON, M. Inst. C. E., F. S. I., and EDWARD KYNASTON BURSTAL, M. Inst. C. E., M. Inst. Mech. E.

This Work (which is a continuation of that published in 1879 by the late Mr. G. W. Stevenson) contains information as to the practice of Parliament during the past twelve years, in regard to most of the points on which differences arise in Opposed Bills for Gas and Water Undertakings. The greatest care has been taken in its compilation; and it is arranged in a very handy form.

*.*The Work by the late Mr. G. W. Stevenson is still on sale, price One Guinea.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO.,

TELEPHONE No. 2698.

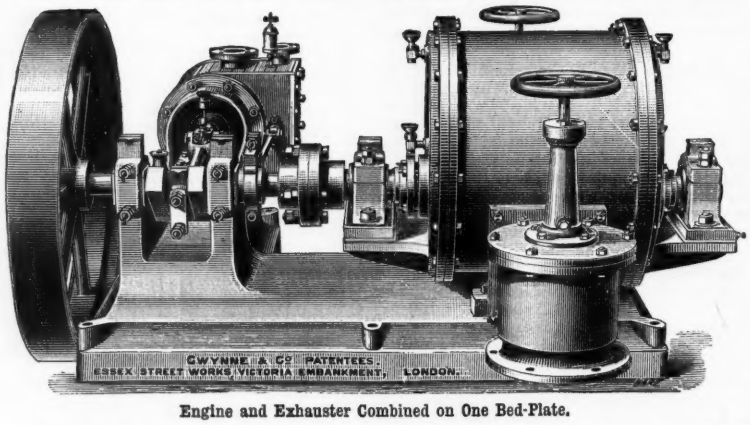
HYDRAULIC AND GAS ENGINEERS, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

WINKELMANN'S "Volcanic" Fire CEMENT. (Fire resistance, 4500° Fahr.)
Prices, particulars, and directions for use on application to ANDREW STEPHENSON, 182, Gresham House, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

FRIEDRICH LUX, Ludwigshafen am Rhein; and at No. 142, Great Portland Street, London, W.
LUX's Gas Regulators for every consumption.
LUX's single-stem Pressure-Gauges.
LUX's Regulator for Gas-Engines.
LUX's Gas-Balance.
LUX's new Gas Regulator for Inverted Lamps; and other Apparatus for Gas Lighting, &c.

LIQUOR and Tar wanted.
BROTHERTON AND CO., Ammonia and Tar Distillers, LEEDS and WAKEFIELD.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 283 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. OXIDE PAINT, SULPHURIC ACID, & Chemicals. 120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

OIL for the "Wells" or "Lucigen" Lamps.
HARDMAN AND CO., Miles Platting, MANCHESTER.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 316.
Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

DRAWINGS, Tracings, Specifications, Quantities, &c., prepared by an experienced Engineering Draughtsman. Plans of Works made, copied, or enlarged. Blue copies made. Illuminated Addresses in first-class style. Writings of all kinds, Engrossments, &c.
Address J. L. FEATHERSTONE 173, Fentiman Road, LONDON, S.W.

WANTED, a Situation as Draughtsman or CLERK OF WORKS. First-class references.
Address No. 2068, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

NINTH YEAR. Now Ready (Demy 8vo., Price 5s. 6d. post free),

THE COMPLETE REPORTS OF THE PROCEEDINGS

OF THE VARIOUS

DISTRICT ASSOCIATIONS OF GAS MANAGERS

For 1891,

Forming a Companion Volume to the Transactions of The Gas Institute, with which it is uniform in size.

*** **THE VOLUMES for 1883 to 1890 ARE STILL ON SALE.**

LONDON: WALTER KING 11, BOLT COURT FLEET STREET E.C.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

OXIDE OF IRON FOR GAS PURIFICATION.

JAMES GORDON & Co., Brokers, can offer Cargoes of good quality; also 300 tons of SPENT OXIDE.
Samples and price on application.
Address Borough Buildings, 7, Rumford Street, LIVERPOOL.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."

AN Improver in Gas-Fitting desires a Situation either in Large or Small Works.
Address, A. REYNOLDS, care of Mr. W. Reynolds, 100, Arthur Street, Small Heath, BIRMINGHAM.

ADVERTISER (age 28) is desirous of a re-engagement in Gas-Works as MANAGER or ASSISTANT MANAGER. Over Twelve years' practical laboratory experience in Coal Carbonizing, Tar Distilling, Sulphate of Ammonia Making, Sulphuric Acid Making, &c., &c. Distance no object.
Address No. 2071, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Gas Manager, the MANAGEMENT of a GAS-WORKS, making 30 to 40 Millions, at home or in the Colonies. Thoroughly practical in Gas, Water, and Electric Light. Good testimonials and references.
Address No. 2069, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN.

WANTED, temporarily, a first-class DRAUGHTSMAN, accustomed to Gas-Works Plant.
State age, experience, and salary required, and send two testimonials, to No. 2067, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CLEETHORPES GAS COMPANY.

WANTED, a trustworthy, capable man as GAS-FITTER, SERVICE LAYER, &c. A permanency and improving position is offered to a steady, reliable Workman.
E. J. BROCKWAY,
Engineer and Manager.

WORKS FOREMAN.

WANTED, at the Lancaster Corporation Gas-Works, a thoroughly practical Man as WORKS FOREMAN. Must be a good Carbonizer, and experienced in the management of Workmen. Constant employment to a thoroughly good and steady man. A good Mechanic preferred. Wages £2 2s. per week.
Apply, in own handwriting, stating experience, with two recent testimonials, on or before the 27th inst., to
C. ARMITAGE,
Engineer.

WANTED, Foreman for Provincial Gas- Works making 60 millions. Must be a steady, sober, trustworthy man, good Carbonizer and Mechanic, and possess such knowledge of general routine as to be fully capable of maintaining order, and properly conducting the Works in the absence of the Manager. House near Works provided.
Applications, in candidate's own handwriting (with copies of references in first instance), stating experience, age, and wages expected, to be sent at once to No. 2070, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MARKET RASEN GAS-WORKS.

THE Directors of the Market Rasen New Lighting Company, Limited (making between 4 and 5 million cubic feet of Gas per annum), require the services of a WORKING MANAGER, to be entrusted with the entire charge of the Works, to keep the Yard Books, take Indices of Meters, and make out the Accounts and collect the money. He must also have a practical knowledge of Interior Fittings, &c.
Applications, stating age, experience, and salary required, with testimonials as to character and fitness, to be addressed to me; but no one need apply who is not fully competent to undertake the duties of the situation, and who is not a thoroughly sober and attentive man of business.
LOUIS RHODES,
Secretary.
Market Rasen,
Feb. 9, 1892.

TO BE SOLD, the Stock-in-Trade and GOODWILL of a Gas Governor Maker and Mill Furnisher.
Apply to JAMES HARDMAN AND CO., 9, Church Terrace, OLDHAM.

SECOND-HAND JOURNAL VOLUMES WANTED.

THE Advertiser is wishful to obtain SECOND-HAND VOLUMES of the JOURNAL, in good condition, for at least the last Fifteen years; but is open to treat for a set from the commencement. Price must be reasonable.
Offers to be addressed to No. 2072, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

RE W. H. BENNETT (DECEASED).

HAVING made arrangements with the well-known Firm of Patent Agents, Messrs. WHEATLEY & MACKENZIE, of 40, CHANCERY LANE, LONDON, W.C., for carrying on my late husband's Business on my behalf, I shall esteem it a great favour if clients and friends will kindly extend to Messrs. W. & M. the same support they accorded him during the last 30 years.
Messrs. W. & M. will be happy to render every assistance in respect to Patent matters in this or any foreign country. All business communications should be addressed to them direct, and such will receive prompt, personal, and careful attention.
(Signed) EMMA BENNETT.
22, Great George Street,
Westminster, S.W.,
Feb. 15, 1892.

WANTED, second-hand Volumes of KING'S TREATISE ON COAL GAS, complete, in good condition.
Apply, by letter, stating price, to No. 2066, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO BE LET on Lease (possession on March 25, 1892), the HEDINGHAM GAS-WORKS, as a going Concern, with Manager's Cottage.
Apply to the SECRETARY, Castle Hedingham, ESSEX.

FOR SALE, cheap—Two Gasholders, 35 ft. diameter by 12 ft. deep. Capacity, 11,500 cubic feet each. Also various other larger sizes.
Two PURIFIERS, 24 ft. by 16 ft. by 4 ft. 6 in. deep, with Valves and Connections.
Four PURIFIERS in a group, 16 ft. by 12 ft. by 3 ft. 9 in. deep, 12-inch Centre-Valve and Connections. Also various other sizes.
WASHERS, from 500,000 to 250,000 feet per diem.
CONDENSERS, from 500,000 to 10,000 feet per diem.
EXHAUSTERS, from 120,000 to 5000 feet per hour.
STATION METERS, from 100,000 to 1500 ft. per hour.
Would erect any of the above, and make practically equal to new.
Inquiries invited for any second-hand Gas Plant.
Apply to SAML. WHILE (late Ashmore and While), 60, Queen Victoria Street, LONDON, E.C.

WINDSOR ROYAL GASLIGHT COMPANY.

SUPPLY OF GAS COALS.

THE Directors of the Windsor Royal Gaslight Company invite TENDERS for the supply of 6250 tons of GAS COALS, to be delivered free at the Windsor Station of the Great Western Railway, such Coals to be either of the following descriptions, viz.:—
NEW PELTON,
PELAW MAIN,
RAVENSWORTH PELAW,
HOLMSIDE,
LONDONDERRY,
EAST PONTOP.
The Coals to be delivered as follows, viz.—April, 1892, 400 tons; May, 400 tons; June, 400 tons; July, 400 tons; August, 400 tons; September, 550 tons; October, 650 tons; November, 650 tons; December, 650 tons; January, 1893, 600 tons; February, 600 tons; March, 550 tons; the same quantities for the Twelve months following, should a Two years' contract be made.
The Company to have the option of increasing the above quantities by 50 tons in any of the months at the contract price per ton for any extra quantity so required.
The Contractor to state for which of the above descriptions of Coals he tenders, and also whether he tenders for the supply for One year or Two years.
The Directors will not entertain any conditional tender, nor any tender for any other class of Coals, nor do they bind themselves to accept the lowest or any tender.
Sealed tenders to be delivered on or before Monday, the 29th day of February, 1892, addressed to the Secretary, Gas Offices, Windsor.
By order,
JOHN HENRY STRANGE,
Secretary.
Gas Offices: 15, Victoria Street,
Windsor, Berks., Feb. 2, 1892.

WINDSOR ROYAL GASLIGHT COMPANY.

TENDERS FOR LIME.

THE Directors of the above Company invite TENDERS for the supply, for Twelve months commencing the 1st of April next, of the following descriptions of LIME, viz.—
WHITE CHALK LIME,
DERBYSHIRE WHITE STONE LIME.
Both of which must be of the best quality, and free from Cores or other inferior substances.
The Chalk Lime to be supplied, as the Company may from time to time order, in quantities of four or five yards, if delivered at the Company's Works, Goswell Lane, Windsor; or in Truck-Loads, if delivered at either of the Railway Stations at Windsor.
The Stone Lime to be delivered, as the Company may from time to time order, in quantities of 5 tons, at the Company's Works, or at either of the Railway Stations at Windsor.
The Contractor to state the price per yard or per ton at which he will deliver the Lime free at the Company's Works or at either Railway Station at Windsor.
About 350 yards of Chalk Lime, and about 120 tons of Stone Lime will be required during the year.
The Directors do not bind themselves to accept the lowest or any tender.
Sealed tenders to be delivered on or before Monday, the 29th day of February, 1892, addressed to the Secretary, Gas Offices, Windsor.
By order,
JOHN HENRY STRANGE,
Secretary.
Gas Offices: 15, Victoria Street,
Windsor, Berks., Feb. 2, 1892.

WELLINGBOROUGH GASLIGHT COMPANY, LIMITED.

TENDERS are invited for the purchase of surplus TAR for One, Two, or Three years.
Particulars on application.
S. H. KIMBELL,
Secretary.

ROCHDALE CORPORATION.

TO IRONFOUNDERS AND OTHERS.

THE Gas Committee of the above Cor- poration invite TENDERS for the supply of the under-mentioned CASTINGS:—
560 yards or thereabouts of 30-inch Cast-Iron Pipes, with T. and B. Joints.
560 yards or thereabouts of 24-inch Cast-Iron Pipes, with T. and B. Joints.
560 yards or thereabouts of 20-inch Cast-Iron Pip with T. and B. Joints.
500 yards or thereabouts of 14-inch Cast-Iron Pipes, with T. and B. Joints.
And such Tees, Bends, and Connections as may be required therewith.
Forms of Tender, together with particulars of weights and any further information, may be obtained on application to Mr. T. B. Ball, the Manager, at the Gas-Works.
Tenders, endorsed "Pipes," must be sent in to me not later than Noon on Wednesday, Feb. 24, 1892.
By order,
ZACH. MELLOR,
Town Clerk.
Town Hall, Rochdale,
Feb. 12, 1892.

SHEFFIELD UNITED GASLIGHT COMPANY.

EFFINGHAM STREET STATION.
TO IRONFOUNDERS, ETC.

THE Directors of this Company invite TENDERS for the supply and erection of Six PURIFIERS, each 34 ft. by 19 ft., together with Wrought-Iron Covers, Lifting Gear, Valves, and Connections; and also Cast-Iron Girders and Columns to form Floor for carrying the same.
Drawings and Specification may be seen, and Bill of Quantities obtained, upon application to the Engineer, Mr. Fletcher W. Stevenson.
The Directors do not bind themselves to accept the lowest or any tender.
Sealed tenders, marked "Tender for Purifiers," and addressed to the undersigned, must be delivered at the Company's Offices, by post, not later than Saturday, March 5 next.
HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
Feb. 12, 1892.

SHEFFIELD UNITED GASLIGHT COMPANY.

GRIMESTHORPE STATION.
CONTRACT No. 6.
TO GASHOLDER MANUFACTURERS.

THE Directors of this Company invite TENDERS for the construction and erection of a FOUR-LIFT GASHOLDER and WROUGHT-IRON GUIDE-FRAMING. The Lifts of the Gasholder will average 145 feet diameter by 29 feet deep.
TENDERS are also invited for a second GASHOLDER, which will be in all respects similar to the first.
The first Gasholder to be completed by June 30, 1893; and the second, by Aug. 31, 1893.
Drawings and Specification may be seen, and Bill of Quantities obtained, upon application to the Engineer, Mr. Fletcher W. Stevenson.
The Directors do not bind themselves to accept the lowest or any tender.
Sealed tenders, marked "Tender for Gasholders," and addressed to the undersigned, must be delivered at the Company's Offices, by post, not later than Saturday, March 5 next.
HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
Feb. 12, 1892.

SHEFFIELD UNITED GASLIGHT COMPANY.

GRIMESTHORPE STATION.
CONTRACT No. 7.

THE Directors of this Company invite TENDERS for the construction of a CONCRETE and BRICK GASHOLDER TANK (No. 2), 152 feet diameter and 30 feet deep, &c.
Drawings and Specification may be seen, and Bill of Quantities obtained, upon application to the Engineer, Mr. Fletcher W. Stevenson.
The Directors do not bind themselves to accept the lowest or any tender.
Sealed tenders, marked "Tender for Gasholder Tank," and addressed to the undersigned, must be delivered at the Company's Offices, by post, not later than Saturday, March 5 next.
HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
Feb. 12, 1892.

SHEFFIELD UNITED GASLIGHT COMPANY.

GRIMESTHORPE STATION.
CONTRACT No. 8.
TO IRONFOUNDERS, ETC.

THE Directors of this Company invite TENDERS for the supply and delivery of IRON-WORK required in the construction of No. 2 Gasholder Tank and Framing.
Bill of Quantities may be obtained, and the Drawings may be seen, at the Company's Offices, upon application to the Engineer, Mr. Fletcher W. Stevenson.
The Directors do not bind themselves to accept the lowest or any tender.
Sealed tenders, marked "Tender for No. 2 Gasholder Tank," and addressed to the undersigned, must be delivered at the Company's Offices, by post, not later than Saturday, March 5 next.
HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
Feb. 12, 1892.

INVERNESS CORPORATION GAS-WORKS.

THE Inverness Gas Commissioners are prepared to receive TENDERS for the erection of a CAST-IRON TANK, 102 feet in diameter, and a TELESCOPIC GASHOLDER, 100 feet in diameter and 25 feet deep.

Also for a set of four PURIFIERS, 20 feet deep by 15 feet, and LIFTING APPARATUS.

Drawings and Specifications may be seen, and all information obtained, by applying to the Gas Manager.

Tenders, properly endorsed, and addressed to Kenneth MacDonald, Clerk to the Commissioners, will be received up to Monday, the 29th inst.

The Commissioners do not bind themselves to accept the lowest or any tender.

Gas-Works, Inverness,
Feb. 10, 1892.

BOROUGH OF MACCLESFIELD.

THE Gas Committee are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve Months or Two years commencing the 1st day of May next.

Tenders, for both One or Two years, and for the Tar or Liquor separately, to be sent in not later than Saturday, the 27th of February, 1892, addressed to the Chairman of the Gas Committee, Town Hall, Macclesfield, and endorsed "Tender for Tar, &c."

For conditions, apply to Mr. Ford, Engineer, Gas-Works, Macclesfield.

The Committee reserve to themselves the right of accepting any tender for the Tar or Liquor separately.

The highest or any tender not necessarily accepted.

W. FREDK. TAYLOR,
Town Clerk.

Feb. 8, 1892.

BOROUGH OF RICHMOND, SURREY.

WATER-WORKS AND PUBLIC BATHS.

TENDERS FOR WELSH COAL.

THE Town Council of the Borough of Richmond, Surrey, invite TENDERS for the Supply of BEST WELSH SMOKELESS STEAM COAL, in Barges of about 40 tons, alongside the Wharf opposite the Water-Works, Richmond, from the 25th of March, 1892, for one year.

The Seam and District from which the Coal is to be supplied must be stated in the tender, and must be strictly adhered to.

Particulars and Forms of Tender can be obtained of Mr. W. G. Peirce, Engineer at the Water-Works. No tender will be recognized, unless it is made on the prescribed form, properly filled up in every respect; and no expenses or claim will be allowed or paid to any person, whether tendering or not.

The Contractor will be required to give the security stipulated by the Public Health Act, 1875, for the due performance of the contract. The contract and bond will be prepared by the Town Clerk.

Sealed tenders, endorsed "Tender for Welsh Coals," and addressed to the Chairman of the Water Supply Committee, Borough of Richmond, must be delivered at the Town Clerk's Office by Two o'clock on Saturday, the 27th of February, 1892.

The Council do not bind themselves to accept the owest or any tender.

FRED. B. SENIOR,
Town Clerk.

Town Clerk's Office, Hill Rise, Richmond, Surrey, Feb. 8, 1892.

MANCHESTER CORPORATION GAS-WORKS.

TAR AND AMMONIACAL LIQUOR.

THE Gas Committee of the Manchester Corporation are prepared to receive TENDERS for the purchase and removal of the TAR and AMMONIACAL LIQUOR to be produced at their Droylsden Station during a period of one or more years from the 31st of March, 1892.

The Committee do not bind themselves to accept the highest or any tender.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Tar and Liquor, Droylsden," must be delivered at the Offices of the Gas Department, Town Hall, on or before Thursday, the 25th day of February next.

Forms of Tender and further particulars may be obtained on application, in writing, to Mr. Charles Nickson, Superintendent of the Gas Department.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Jan. 29, 1892.

MANCHESTER CORPORATION GAS-WORKS.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the purchase and removal of the GAS TAR to be produced at their several Stations during a period of One, Two, or Three years, commencing as follows, viz.:—

Bradford Road Station, from noon on the 31st of March, 1892.
Rochdale Road Station, from noon on the 24th of June, 1892.
Gaythorn Station, from noon on the 1st of August 1892.

The Committee do not bind themselves to accept the, highest or any tender, and reserve the right to divide the tenders as they may consider advisable.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Tar," must be delivered at the Offices of the Gas Department, Town Hall, on or before Thursday, the 25th of February next.

Forms of Tender and other particulars may be obtained on application, in writing, to Mr. Charles Nickson, Superintendent of the Department.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Jan. 29, 1892.

TO TAR DISTILLERS AND OTHERS.

THE Godalming Gas Company invite TENDERS for the Surplus TAR produced at their Works (about 1000 Barrels) during Twelve months from Febr. 29, 1892, to the end of February, 1893.

Tenders to be sent to the undersigned (from whom any information may be obtained), on or before the 20th inst.

S. BARK,
Secretary and Manager.

TO IRONFOUNDERS AND OTHERS.

CAST-IRON MAIN PIPES.

THE Gas Committee of the Dukinfield Local Board are desirous of receiving TENDERS for 950 yards of 12-inch Turned and Bored PIPES by the 27th inst.

For Specification, apply to

HARRISON VEEVERS,
Engineer.

Local Board Offices, Dukinfield,
Feb. 1, 1892.

CITY OF BELFAST.

CONSTRUCTION OF RETORT-BENCH.

THE Gas Committee of the Corporation invite TENDERS for the erection of a RETORT-BENCH of eighteen Arches (Settings for Retorts not included).

Drawings and Specification may be seen at the Office of the Engineer, at the Gas-Works.

Copy of Specification and Form of Tender may be obtained on payment of One Guinea, returnable if *bonâ fide* tender be sent in.

Any Contractor who may not be able to inspect the Plans at the Engineer's Office, can obtain a complete set of same with extra Specification, &c., on payment of Three Guineas, not returnable.

Sealed tenders, on the prescribed form, endorsed "Tender for Retort-Bench," to be delivered in my Office before Ten o'clock a.m., on Thursday, the 25th of February.

The lowest or any tender not necessarily accepted.

SAMUEL BLACK,
Town Clerk.

KENT COUNTY ASYLUM, CHARTHAM DOWNS, NEAR CANTERBURY.

COALS.

PERSONS willing to Contract with the Committee of Visitors of the County Lunatic Asylum at Chartham, for supplying that Establishment with 250 tons of BEST PELAW MAIN GAS COALS, are requested to deliver sealed TENDERS for the same, according to a Form to be had at the Asylum, on the morning of the 18th inst.

To be delivered into the Coal-Store at the Asylum Gas-Works by the 19th of March next, and to be paid for within Four Months after delivery.

The Visitors do not pledge themselves to accept the lowest tender; and they reserve to themselves the right to accept or reject the whole, or any part of every tender.

THOMAS BARTON,
Clerk and Steward.

Feb. 2, 1892.

BOROUGH OF BURTON-UPON-TRENT.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, invite TENDERS for the supply, construction, and erection of a SULPHATE OF AMMONIA PLANT, exclusive of Buildings, capable of dealing with the production of from 30 to 35 tons of Ammoniacal Liquor per 24 hours.

Persons tendering must submit with their tenders detailed Drawings and Specification, and must state where similar Plant has been erected.

Sealed tenders, endorsed "Sulphate of Ammonia Plant," are to be delivered to me at or before Ten a.m. on Saturday, the 27th of February inst.

The Council do not bind themselves to accept the lowest or any tender, nor will they pay any expense or charge relating to the making or delivery of the same.

F. L. RAMSDEN,
Manager and Engineer.

Gas-Works, Burton-upon-Trent,
Feb. 12, 1892.

SMETHWICK LOCAL BOARD OF HEALTH.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the following, viz.—

BRICKWORK, &c., in Retort House, according to Drawings and Specification.
NEW OFFICES. Building three Rooms as per Drawing and Specification.
RETORTS (Sectional or Brick) and FIRE-CLAY GOODS for Regenerative Furnaces.
STATION METER, to pass 30,000 cubic feet per hour, with Bye-Pass Valve and Connections.
WASHER. "Standard" Washer of 750,000 cubic feet per day capacity.
CONDENSER of 750,000 cubic feet per day capacity.
EXHAUSTER of 60,000 cubic feet per hour capacity.
ENGINE (Horizontal) for Exhauster.

Drawings and Specifications may be seen, and further particulars and information obtained, upon application to Mr. B. W. Smith, Engineer, at the Gas-Works, Rabone Lane, Smethwick.

The Committee do not bind themselves to accept the lowest or any tender.

Tenders, properly endorsed, to be delivered to me, at the Public Buildings, not later than the 25th day of February inst.

By order,
W. J. STURGES,
Secretary.

Gas Offices, Public Buildings,
Smethwick, Feb. 13, 1892.

HAWORTH LOCAL BOARD OF HEALTH.

THE above Local Board are prepared to receive TENDERS for the purchase of surplus TAR and AMMONIACAL LIQUOR from March 26, 1892, to March 25, 1893, delivered on Rails at Haworth Railway Station.

Tenders, marked "Tar and Liquor Tender," to be sent to me, the undersigned, not later than Thursday, Feb. 25, 1892.

WM. ROBERTSHAW,
Clerk to the Board.

5, Temple Street, Haworth.

FYLDE WATER-WORKS COMPANY.

£20,000 FOUR PER CENT. PREFERENCE STOCK, 1891.

TENDERS are invited for the above STOCK, in lots of £100 each.

Tenders to be received not later than Monday, the 7th of March, 1892.

Applicants may tender for more than one lot.

For Form of Tender and full particulars, apply to

C. ARTHUR,
Secretary.

Head Office: Kirkham, Lancashire,
Feb. 5, 1892.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is hereby given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the "Bell Hotel," Bromley, Kent, on Thursday, the 25th day of February inst., at Six o'clock precisely, to receive the Report of the Directors, the Balance-Sheet confirmed by the Auditors, to declare Dividends, and for General Business.

The Transfer Books will be closed from the 13th to the 25th of February, 1892, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices: At the Works, Bromley, Kent, Feb. 10, 1892.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is hereby given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors in the Company, will be held at the Company's Offices, Willoughby Lane, Tottenham, on Saturday, the 27th day of February inst., at Three o'clock in the Afternoon precisely, to receive the Report of the Directors, the Statement of Accounts for the Half Year ended the 31st of December, 1891, to declare Dividends, and to transact such other Business as the Act of Parliament directs.

The Transfer Books will be closed on Saturday, the 13th inst., until Tuesday, the 1st day of March next, both days inclusive.

By order of the Board,
JAMES RANDALL,
Secretary.

Offices of the Company: Willoughby Lane, Tottenham, Feb. 12, 1892.

NOTICE OF GENERAL MEETING.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

TO THE PROPRIETORS.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 5, Great Winchester Street, London, on Friday, March 4, 1892, at Two o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 31st of December, 1891, to declare Dividends, to elect Directors, to appoint a Special Auditor, and for other purposes.

The Transfer Books of the Company will be closed from the 20th of February to the 4th of March, both days inclusive.

By order,
W. H. HARDY,
Secretary.

Offices: 5, Great Winchester Street, London, E.C., Feb. 13, 1892.

BY ORDER OF THE EXECUTORS OF THE LATE J. J. KEILY, ESQ.

Seventy £10 Original Fully-paid Shares, and 35 Additional £10 Shares (£4 paid) in the West Kent Gas Company, paying Dividends of 10 and 7 per cent. respectively, in numerous lots.

MESSRS. BROAD and WILTSHIRE will SELL by AUCTION, at the Mart, Tokenhouse Yard, E.C., on Monday, Feb. 29, at Two o'clock precisely, 70 £10 ORIGINAL FULLY-PAID SHARES and 35 ADDITIONAL £10 SHARES (£4 paid) in that well-established Undertaking known as the West Kent Gas Company, which pays the maximum authorized Dividend of 10 and 7 per cent. on the respective classes of Shares.

The Company supplies large and rapidly increasing Districts; and its Shares may be considered as offering to the public a thoroughly sound investment.

Particulars at the Mart; of Messrs. WETHERFIELD, SON, AND BAINES, Solicitors, 1, Gresham Buildings, BASINGHALL STREET, E.C.; or of the AUCTIONEERS, 7, Queen Street, CHEAPSIDE, E.C.

Demy 8vo., price 6d., post free.

THE STANDARD OF LIGHT.

By WALTER GRAFTON,

Of The Gaslight and Coke Company, Beckton.

LONDON:

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

Price 2s. per dozen, or 10s 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

Price: 10s. *per* 100; £1 2s. 6d. *for* 250; £2 *for* 500; £3 15s. *per* 1000. *Specimen copy (by post)*, 4d.

The Use and Value of

Sulphate of Ammonia as Manure.

BY

WILLIAM ARNOLD, F.S.I.,

Land and Estate Agent; Rating Surveyor and Valuer
Chairman of the Tamworth Gaslight and Coke Company

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

COKE BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT.)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,
PARK STREET, SOUTHWARK, E.C.

For **FIRE-BRICKS,** the most durable for **GAS-FURNACES,**

ADDRESS

JAMES WHITE & Co., Limited,
ALBERT WORKS, WIDNES.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS,

BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

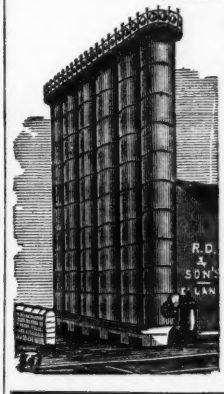
NEWBATTLE CANNEL.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

DEMPSTERS'

(LIMITED.)



CONDENSERS,
CONDENSERS,
CONDENSERS.

ELLAND.

THOMAS TURTON AND SONS, LIMITED,

Sheaf & Spring Works,
SHEFFIELD,
MANUFACTURERS OF

FILES OF BEST QUALITY
FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

London Office:
90, CANNON STREET, E.C.

Lanemark Coal Co.,

LIMITED.

LANEMARK CANNEL AND GAS COALS.

Quotations and Analysis on application to

LANEMARK COLLIERY,
NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

THOMAS ILLINGWORTH,

NORTH DEAN CHEMICAL WORKS
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.

TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

CAST-IRON PIPES

FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."
WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW.

T. B. KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL

ENGLISH & SCOTCH CANNELS.

REAL SILKSTONE GAS COAL

ANALYSIS AND PRICES ON APPLICATION.

T. B. KITTEL, SHEFFIELD.

PUBLIC HEALTH.

10,000,000 GALLONS
OF
PURE SPRING WATER

CAN BE SUPPLIED DAILY TO

ANY PART OF LONDON,
WITHIN A FEW MONTHS.

GEORGE WEBSTER,
29, Cannon Street,
LONDON, E.C.

MORRIS & CUTLER'S

PATENT

CONDENSER

IN USE AT 70 IMPORTANT WORKS,

AND NOW UNDER CONSTRUCTION FOR

MANCHESTER (third Machine ordered),

BELFAST,

HARROGATE,

BRAZIL,

HONG-KONG.

EFFECTIVE. COMPACT. ORNAMENTAL.

Saml. CUTLER & SONS,

16, GT. GEORGE STREET, WESTMINSTER, LONDON, S.W.

AND

PROVIDENCE IRON-WORKS, MILLWALL, LONDON, E.

AUG. KLÖNNE,

DORTMUND (GERMANY).

REGENERATIVE FURNACES.

Unsurpassed in

Efficiency, Economy, Durability, and Easy Working.

MEIKLEJOHN'S PATENT

Improved Slide-Valve Anti-Dip.

Is perfectly reliable in action, and requires no attention. Has all the advantages of the Dip and Anti-Dip combined.

Is cheap and easily fixed to any form of main.

Will be found the most efficient appliance of the kind yet introduced.

Further particulars and price from

C. MEIKLEJOHN,

OLDBURY, BIRMINGHAM.

(Late N. MEIKLEJOHN, Longwood.)

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

MIRFIELD, NORMANTON.

THOMAS LIGHTING Co.,

LTD.,

15, CARTHUSIAN ST.,

LONDON, E.C.

Manufacturers of the "Thomas" Patent Lamps for general lighting, also for Public Buildings, Institutions, &c., and for outside purposes.

The best Regenerative Lamp in the Market.

Special quotations to Gas Companies.

HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production nearly 3000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16½ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves 69 per cent. of excellent Coke. During the year 1890, the London Gas Companies carbonized about 400,000 tons of HOLMSIDE COALS. They are used by The Gaslight and Coke Company, the South Metropolitan Gas Company, the Commercial Gas Company, the Woolwich (Government) Gas-Works, the Newcastle and Gateshead Gas Company, the European Gas Company, the Ipswich Gas Company, and by many other Gas Companies both at Home and Abroad.

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-ON-TYNE.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97 WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

PATENTS FOR INVENTIONS,

REGISTRATION OF TRADE MARKS and DESIGNS in all Countries.

SEARCHES made *re* novelty, and opinions given on all matters connected with above. *Full particulars on application to*

J. C. CHAPMAN,

Assoc.M.Inst.C.E., M.Inst.M.E., Chartered Patent Agent,

70, CHANCERY LANE, LONDON, W.C.

Special experience in Gas and Ammonia Plant.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

For Prices and complete Analysis, apply to

YOUNG, DANCE, & CO.,

COAL OWNERS, NEWCASTLE-ON-TYNE.

Or E. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP.

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

HENRY GREENE & SONS,

SOLE CONSIGNEES FOR GREAT BRITAIN & COLONIES,

153 TO 155, CANNON STREET,

LONDON BRIDGE, E.C.

TELEGRAPHIC ADDRESS "GAS, LEEDS."

CLAYTON, SON, & Co.

LIMITED,

LEEDS,

MAKE

RETORT LIDS

OF ALL FORMS AND SHAPES

IN IRON OR STEEL

BY SPECIAL HYDRAULIC MACHINERY.

LONDON OFFICE: 60, QUEEN VICTORIA STREET, E.C.

PRICES ON APPLICATION.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S PATENTS

All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.

— REGENERATIVE SETTINGS OF RETORTS. —

Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable; while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.

Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

REDUCE THE COST OF PURIFICATION

By taking up 40 per cent. Carbonic Acid, 50 per cent. Sulphuretted Hydrogen, diminishing Sulphur Compounds, and removing all Ammonia and Tar,

BY THE USE OF

C. & W. WALKER'S

PATENT

PURIFYING MACHINE.

THE STATEMENTS OF VARIOUS GAS MANAGERS ARE—

"*Your Machine will clear itself in five years.*"

"*My Purifiers last as long again since your Machine was put in.*"

"*I have saved hundreds of Tons of Lime per annum since your Machine was started.*"

"*I use your Machine for the removal of CO_2. I am therefore able to save one-half of my original quantity of Lime.*"

"*Your Purifying Machine is not only a Purifying Machine in name but in Work.*"

"*Your Purifying Machine is doing 50 per cent. more than you guaranteed it to do.*"

It has proved itself by many years of work at Gas-Works, amongst which are—

London (4).	**Glasgow (2).**	**Wakefield.**	**Santiago.**
Cheltenham.	**Burnley.**	**Hornsey.**	**Colne.**
Blackpool.	**Northampton.**	**Mirfield.**	**Stafford.**
Crystal Palace.	**Stalybridge.**	**Dunfermline.**	**Bournemouth.**
Harrogate.	**Widnes.**	**Alloa.**	**Melbourne.**
Stone.	**Church.**	**Leeds (2).**	**Monte Video.**
	Birmingham.	**Brussels.**	

MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE,

And 8, Finsbury Circus, London.

G. J. EVESON,

GAS COAL AND CANNEL CONTRACTOR,

PATENTEE OF

A SPECIAL COMPOUND for the cure of Stopped Ascension-Pipes,

A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.

Price and particulars on application. **Head Office: CORPORATION STREET, BIRMINGHAM.**

WILLEY & Co.,

Gas Engineering Works, Commercial Road, Exeter.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS,

GASHOLDERS, Telescope and Single-Lift, any size. Some of the largest in the Kingdom erected by this Firm are giving the highest satisfaction.

PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.

Makers, by permission of that eminent authority **Mr. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

WET AND DRY METERS,

which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

GASHOLDERS

C. & W. WALKER

Have erected Gasholders of all dimensions, during the last 40 years, in all parts of Great Britain, and throughout the civilized world, for upwards of 500 Gas Companies and Municipalities; all of the best materials and highest class of workmanship.

They are now erecting a four-lift Holder of about 8 MILLION cubic feet, at the Beckton Gas-Works, London.

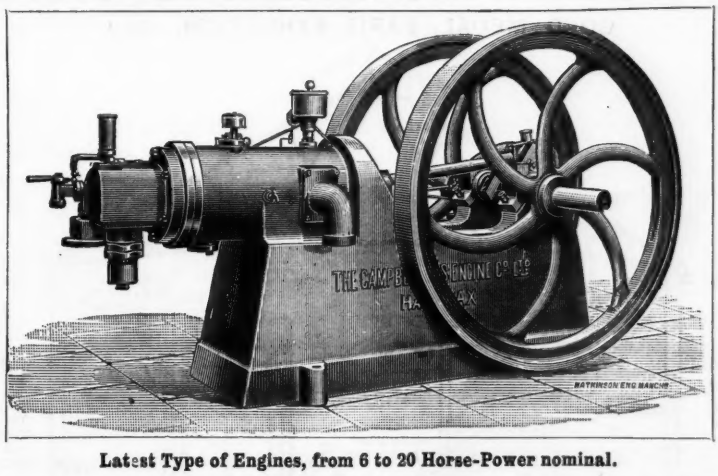
MIDLAND WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE;

AND

8, Finsbury Circus, London, E.C.

THE "CAMPBELL" GAS-ENGINE,

MOST SIMPLE AND MOST EASILY MANAGED.



MOST ECONOMICAL IN GAS AND LEAST LIABLE TO BREAKDOWNS.

Latest Type of Engines, from 6 to 20 Horse-Power nominal.

Our Engines are used by Her Majesty's War Department; The South Metropolitan Gas Company, London, S.E.; at the Bedworth Gas-Works; Crossgates Gas-Works; Tiverton Gas-Works; &c.

PRICES AND FULL PARTICULARS FROM THE SOLE MAKERS—

THE CAMPBELL GAS-ENGINE CO., LTD., HALIFAX, ENGLAND.

LONDON: 114, Tooley Street, London Bridge. GLASGOW: 111, West George Street.

BIRMINGHAM: 103, Snow Hill.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

A STOCK OF DIFFERENT SHAPES ON HAND.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
C X C	"JACKSON"	BECK & Co.,
MARK.	CLAY CROSS.	130, GT. SUFFOLK ST., S.E.

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT, BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

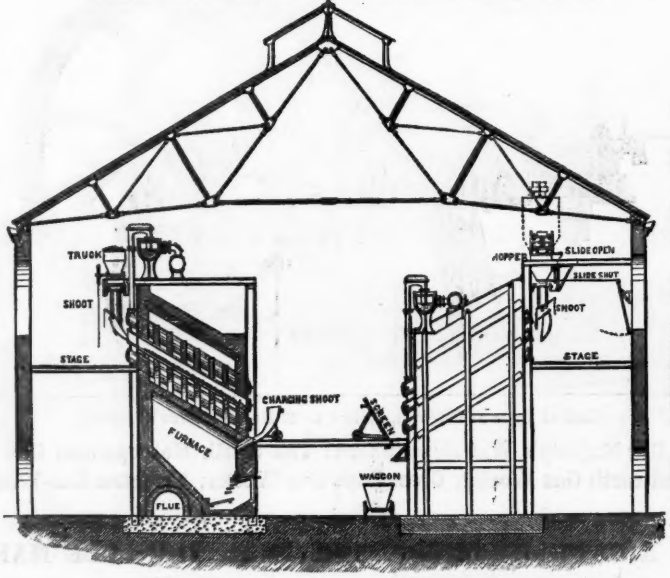
ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

THE AUTOMATIC SYSTEM OF CHARGING & DRAWING INCLINED GAS-RETORTS.

GOLD MEDAL, PARIS EXHIBITION, 1889.

GAS and CHEMICAL WORKS in ENGLAND where the System is in operation, or at present erecting, under the Company's Licence—

LONDON—
BECKTON.
BRENTFORD.
EAST GREENWICH.
KENSAL GREEN.
NINE ELMS.
PIMLICO.
SOUTHALL.
BIRKENHEAD.
BIRMINGHAM.
BURNLEY.
CHATTERLY.
COVENTRY.
MANCHESTER.
MIDDLESBROUGH.
OXFORD.
ROCHDALE.
TUNSTALL.



Section.
Showing Ascension-Pipes and Hydraulic Main at top of Retort. Charged by movable Shoot and Truck.

Elevation.
Showing Ascension-Pipes at bottom of Retort Charged by movable Shoot and Continuous Hopper arrangement along Beds.

The whole worked from Stage. With or without Regenerative Settings.

Advantages—

1. NO SKILLED LABOUR REQUIRED.
2. WEAR AND TEAR OF CARBONIZING TOOLS REDUCED 50 PER CENT.
3. GREAT REDUCTION IN THE ERECTION OF ASCENSION-PIPES AND HYDRAULIC MAINS.
4. COAL CARBONIZED ONE-SIXTH QUICKER THAN BY THE OLD PROCESS.
5. ABSOLUTE CONTROL OF PRODUCTION BY UNSKILLED LABOUR (THIS IS IMPORTANT ESPECIALLY WHERE THERE IS AN EXTRA DEMAND FOR GAS, AS IN THE CASE OF MEN ON STRIKE, FOGGY DAYS, ACCIDENTS, &c.)
6. SAVING OF 50 PER CENT. IN SPACE OF PERMANENT BUILDINGS.
7. SAVING OF 70 PER CENT. IN COST OF LABOUR.

These Systems are fully Patented, and any Infringer will be strictly proceeded against.

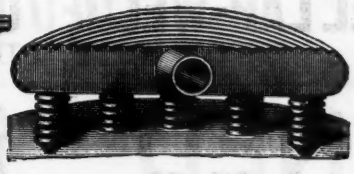
For further particulars apply to W. M. KIGHT, Secretary of THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86 and 88A, LEADENHALL STREET, LONDON, E.C.

PARKINSON'S PATENT GAS-FIRES.

THE "ROYAL" (Registered)

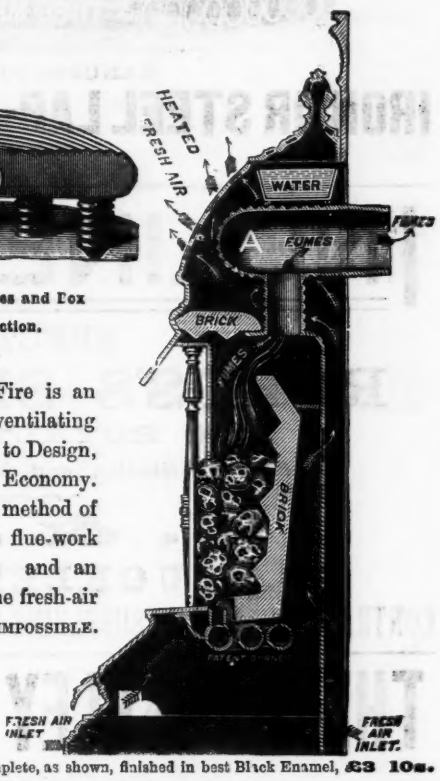
With Curved Front Fire.

This new Gas-Fire is both artistic and elegant in design. It is constructed on the ventilating principle. Fresh air is drawn in at the lower part of the Stove, and, while circulating around a series of tubes, it is heated, and then escapes through the perforations in the dome-shaped top, IN A PERFECTLY PURE STATE. The Heating Power of this Stove is unexcelled by any Gas-Fire yet made. Ventilation is perfect; and no Fumes can escape into the room where it is fixed.



Corrugated Flue-Pipes and Box marked A in section.

This Patent Gas-Fire is an improvement on any ventilating Stove yet introduced as to Design, Heating Power, and Economy. The drawings show the method of construction. All the flue-work is CAST IN ONE PIECE; and an escape of Fumes into the fresh-air chamber is ABSOLUTELY IMPOSSIBLE.



Price complete, as shown, finished in best Black Enamel, **£3 10s.**

The "RUBY."

Finished in the best possible manner in Black Ename with Nickel Plated Trivet, as shown.
Price: No. 2, **12s. 6d.**; No. 4, **18s. 6d.**
Stand for above, fitted with Tiles, **9s.**

Gold Medals Awarded for
GAS-STOVES
AT
DERBY AND WOLVERHAMPTON EXHIBITIONS.

The "DOMESTIC."

Price, complete, finished in Black Enamel, **32s.**
Extra finish, with Tiles in top and sides, Brass Fender, &c., **40s.**
Boiling-Burner fitted at top, extra, **17s.**
Stand for above, fitted with Tiles, **12s. 6d.**

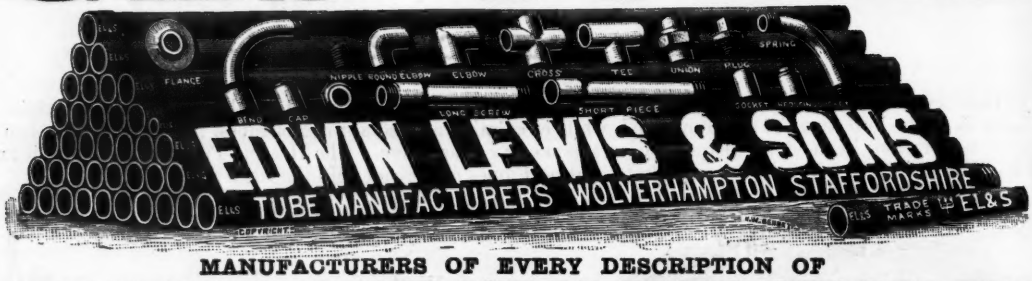
COMPLETE PRICE LIST OF
PARKINSON'S PATENT FIRES,
Cooking-Stoves, Grillers, Hot-Plates, Boiling-Burners, &c., sent on application.

W. PARKINSON & CO.,
COTTAGE LANE, CITY ROAD, LONDON.
BELL BARN ROAD, BIRMINGHAM.

See also Advt., p. 286.

ESTABLISHED 1825.

GAS TUBES



MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

INCLINED RETORTS

ERECTED COMPLETE, WITH

ROBUS'S SPECIAL FURNACES.

NO ROYALTY OR PATENT CHARGES.

Plans, Estimates, and full particulars, upon Application to the Erectors.

J. & H. ROBUS,

20, BUCKLERSBURY, LONDON, E.C.,

CONTRACTORS FOR THE SUPPLYING & ERECTING OF EVERY REQUISITE FOR GAS & WATER WORKS.

THE HORSELEY CO., LTD., TIPTON, STAFFORDSHIRE,

MAKERS OF

GAS HOLDERS & GAS PLANT,

PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES

PIPES, LAMP PILLARS, RETORT-FITTINGS, ETC.

ALSO ALL KINDS OF

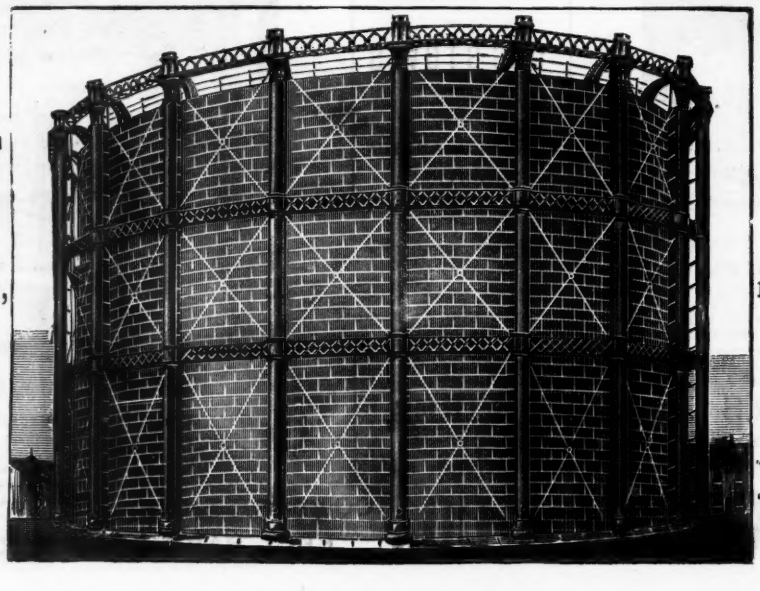
STRUCTURAL IRON

AND STEEL WORK,

BRIDGES,

ROOFS,

PIERS, ETC.

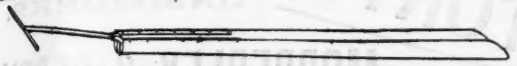


WORKS & HEAD OFFICE:
TIPTON,
STAFFORDSHIRE

LONDON OFFICE:
11, VICTORIA ST.,
WESTMINSTER.

TELEGRAPHIC ADDRESSES:
"HORSELEY, TIPTON."
"GALILEO, LONDON."

STEEL SCOOPS
FOR
RETORT CHARGING.



Scoops supplied with or without handles, and of any dimensions or shape required.

HENRY SYKES, Engineer,
66, BANKSIDE, LONDON, S.E.

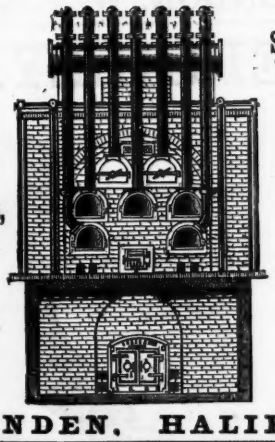
HENRY BALFOUR & CO.,
LEVEN, FIFE,
MAKERS OF
GASHOLDERS
And all Classes of GAS PLANT,
REVOLVING BRUSH SCRUBBERS, FOUR-WAY VALVES.
LONDON: 13, BILLITER STREET, E.C.

WILLIAM INGHAM & SONS,
Incorporated with the Leeds Fire-Clay Company, Ltd.,
WORTLEY FIRE-CLAY WORKS,
Near LEEDS

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—
1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

JONAS DRAKE & SON,
GAS ENGINEERS, CONTRACTORS, IRONFOUNDERS, RETORT SETTERS, ETC.



SPECIALITIES IN CARBONIZING PLANT, GENERATOR & REGENERATOR FURNACES.

OVENDEN, HALIFAX.

WILSON CARTER & PEARSON,
GAS COAL AND CANNEL FACTORS,
Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.
ADDRESS CHIEF OFFICES:
Temple Buildings, 50, New Street, Birmingham.

USED AT THE GAS-WORKS
AT
Ascot, Birmingham, Broadstairs, Bromsgrove, Hendon, Ilkeston, Kildwick, Knutsford, Leven, N.B., Pembroke, Seaham Harbour, Stamford, Stroud, Harwich, Uttoxeter, Wigston, &c., &c., and by Corporations and leading Engineers throughout the Country, for preventing

BOILER INCRUSTATION.

Absolutely Harmless and free from Acids.

ADOLPHE CROSBIE,
Chemical Works, Wolverhampton.

Crosbie's Paints for Gas-Works. Economical and Durable.

J. & W. HORTON
ETNA WORKS,
SMETHWICK,
NEAR BIRMINGHAM
(Established 50 Years),
PATENTEES
AND
MANUFACTURERS
OF

IMPROVED GASHOLDERS AND BOILERS

and Manufacturers of every description of
Gas Apparatus,
Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

Drawings, Specifications, and Estimate supplied.

CLOTH CASES
FOR
BINDING SUBSCRIBERS' VOLUMES OF THE "JOURNAL"
CAN BE HAD OF THE PUBLISHER,
Price 2s. each.

JOHN BROWN & CO., LTD., SHEFFIELD,
Proprietors of
ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

INCLINED RETORTS,

FIRE BRICKS,
LUMPS, TILES,
BLOCKS, &c.

Special Bricks for Intense Heats.

GAS RETORTS.

CASTINGS AND EVERY REQUISITE FOR GAS-WORKS.

MOBBERLEY & PERRY,
Fire-Brick Works, STOURBRIDGE.

☛ Retort Setters sent to any part of the Kingdom.

"LIGHT, Wenham Gas Lamps MORE LIGHT."

ITS ADVANTAGES ARE:

IMMENSE ECONOMY IN THE CONSUMPTION OF GAS.

INTENSITY, PURITY, AND STEADINESS OF THE LIGHT.

Absence of Downward Shadow. *Practical Completeness of Combustion.*

CAN BE FITTED TO ORDINARY SUPPLY-PIPES WITHOUT ALTERATION.

CAN BE USED AS VENTILATING LIGHTS, whereby the products are removed, and damage to decorations, &c., prevented.

SOLE PROPRIETORS AND MANUFACTURERS: **THE WENHAM COMPANY, LIMITED,**

Birmingham Branch: 4, DALE END.

Works: UPPER OGLE ST., LONDON, W.

Manchester Branch: 5, DEANSGATE.

CLAPHAM BROTHERS, KEIGHLEY. ESTABLISHED 1837.

Telegraphic Address: "CLAPHAM BROTHERS, Keighley."

WELLINGTON, NELSON, & MARKET ST. WORKS.

Telephone No. 223.

Laycock and Clapham's Patent.

The most efficient Machine known for extracting Ammonia and other Impurities from Coal Gas.

55 "Eclipse" Washer-Scrubbers, varying in capacity from 50,000 to 4,000,000 cubic feet per day, passing a total of 54,450,000 cubic feet of Gas per day, have been erected.

The Patent Wooden Balls thoroughly break up the Gas; give an immense amount of freshly-wetted Surface; and do not clog or increase back pressure.

Whilst the Gas is passing through and amongst the Balls, it is continually showered upon by the contents of Buckets.

The Shaft Revolves in Improved Bearings, and all Workings are accessible.

REPAIRS AND TROUBLE REDUCED TO A MINIMUM.

"YOU DON'T SAY SO!"

London: Printed by WALTER KING (at the office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Feb. 16, 1892.